Heating Piping & Air Conditioning

MARCH 1956

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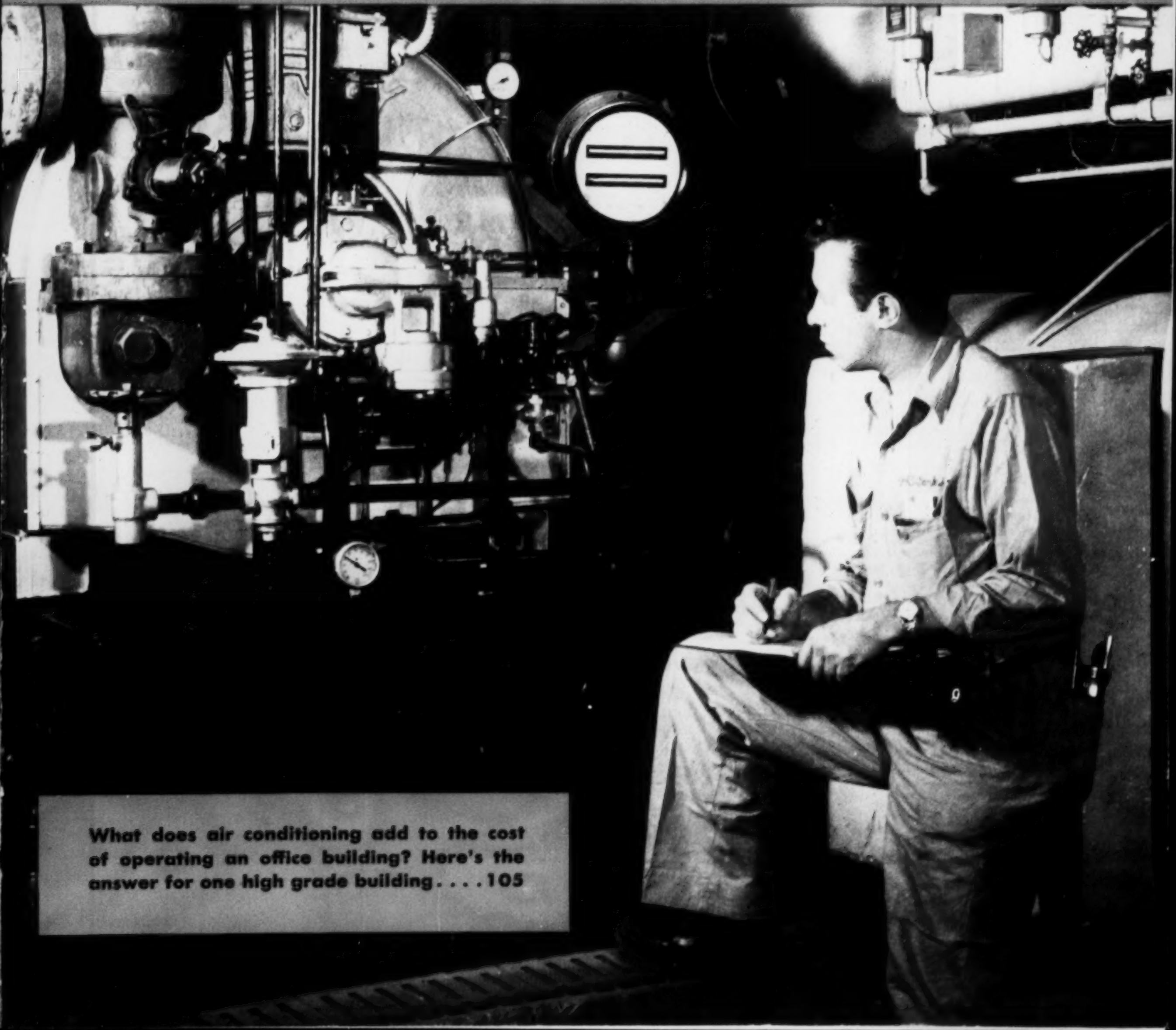
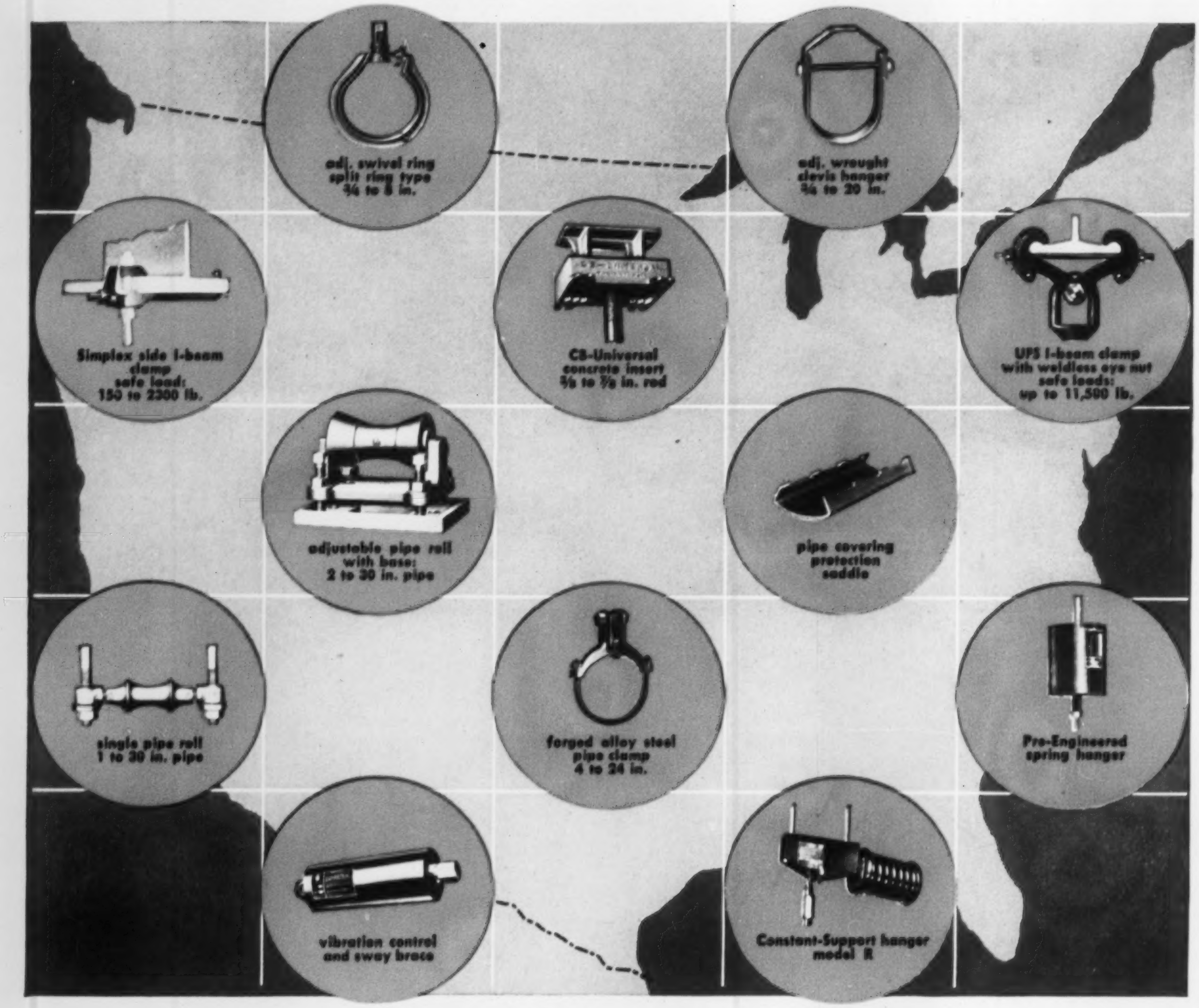
INDUSTRIAL • COMMERCIAL • INSTITUTIONAL • PUBLIC BUILDINGS

Journal Section of the American Society of Heating and Air-Conditioning Engineers—p. 149



What does air conditioning add to the cost of operating an office building? Here's the answer for one high grade building 105

GRINNELL OFFERS YOU


adj. swivel ring
split ring type
¾ to 8 in.
adj. wrought
clevis hanger
¾ to 20 in.
Simplex side I-beam
clamp
safe load:
150 to 2300 lb.
CB-Universal
concrete insert
⅝ to ⅞ in. rod
UFS I-beam clamp
with weldless eye nut
safe loads:
up to 11,500 lb.
adjustable pipe roll
with base:
2 to 30 in. pipe
pipe covering
protection
saddle
single pipe roll
1 to 30 in. pipe
forged alloy steel
pipe clamp
4 to 24 in.
Pre-Engineered
spring hanger
vibration control
and sway brace
Constant-Support hanger
model R

the largest line, widest distribution, finest service in

PIPE HANGERS AND SUPPORTS, ANYWHERE!

Grinnell is America's No. 1 supplier of pipe hangers and supports. There is no other company, anywhere, which provides as thorough and complete distribution service; makes as complete a line; or can cooperate as fully with you on *all* your piping assignments..

Through Grinnell's coast-to-coast system of strategically located warehouses and jobbers, for example, you can purchase Grinnell Hangers out of stock, anywhere. Moreover, Grinnell, alone, of all manufacturers, maintains a staff of trained personnel that is ready to work with you "on the job", anywhere, in solving any problem connected with erection of pipe hangers and supports. Profit by Grinnell's nationwide service, large-capacity manufacturing facilities, and practical knowledge gained during more than 100 years of service in the piping field. Next time, specify Grinnell Pipe Hangers.

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**AMERICA'S #1 SUPPLIER OF
PIPE HANGERS AND SUPPORTS**

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pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
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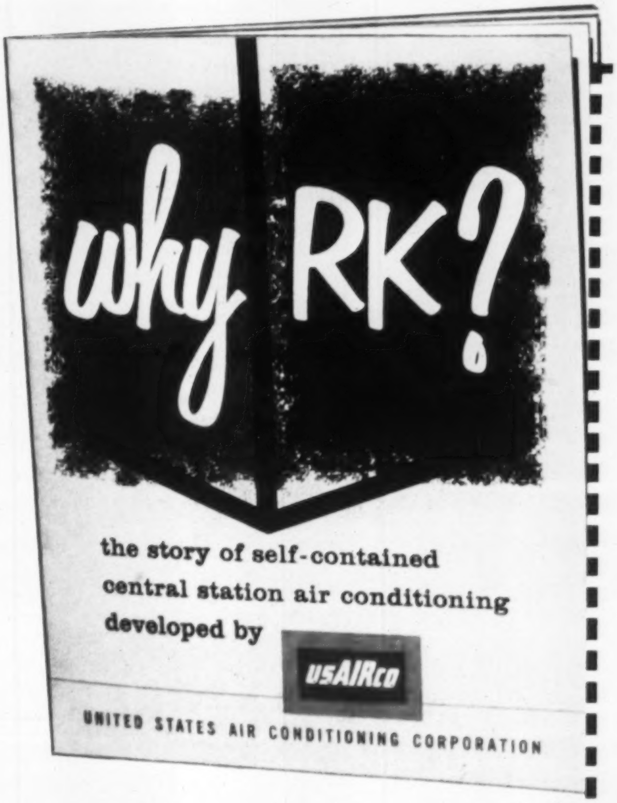
JUST CLIP THE COUPON BELOW AND MAIL!

NOW . . . a wonderful aid in explaining self-contained central station air conditioning . . . yours for a postage stamp!

Your entire organization will want a copy of this new, helpful booklet explaining the development and use of central station air conditioning. Its 36 pages contain the entire history and development of comfort cooling, in non-technical terms. Explaining the basic components of central air conditioning, "Why RK?" describes and illustrates the principle of the refrigeration cycle . . . and develops the explanation in simple, understandable steps. The refrigeration cycle is applied to built-up and packaged units and to the usAIRco RK central station unit. RK's contain in one cabinet a factory assembled and pre-tested central plant, including built-in evaporative condenser for water conservation. A three-page pull-out shows the treatment of a typical building with built-up, packaged and RK systems. Initial, operating and maintenance costs are compared. This is a basic book that every engineer and contractor should have in his library to help him explain air conditioning to his clients.


why RK?
the story of self-contained
central station air conditioning
developed by
usAIRco
UNITED STATES AIR CONDITIONING CORPORATION

usAIRco

UNITED STATES AIR CONDITIONING CORPORATION

3300 COMO AVENUE S. E. • MINNEAPOLIS 14, MINN.

GENTLEMEN:

Please rush my free copy of the "WHY RK?" booklet.

My name ________________

Company name ________________

Address ________________

City ________ State ________

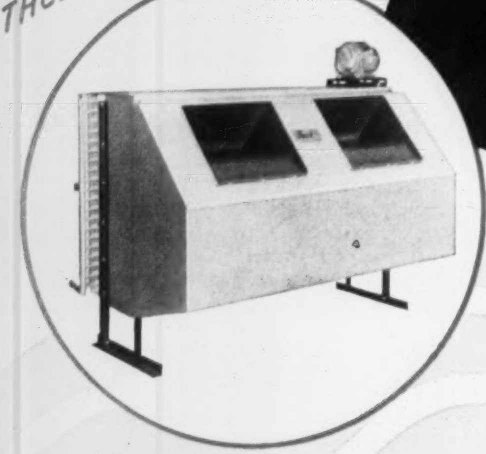
Type of business ________________

____

My position ________________

THEY'RE SO QUIET

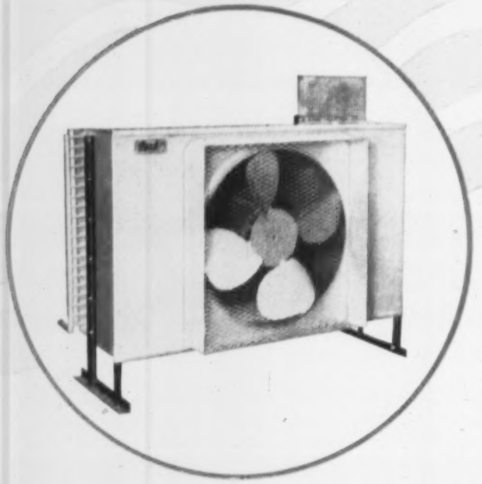
NEW 'BC' UNITS EXTEND RANGE OF BUSH AIR COOLED CONDENSERS to 20 TONS...



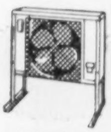
NEW **Bush 'BC' Blower Condensers permit air conditioning and refrigeration systems to operate *without water* . . . provide the answer to excessive water costs, limited supply, excessive impurities or disposal problems.**

Available in capacities up to the 20 Tons, new Bush 'BC' Blower Condensers feature *low noise level . . . quiet operation.*

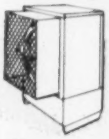
Patented Inner-Fin coil construction, *a Bush exclusive,* makes these the most compact units on the market. Units are easy to install, have rugged all-steel cases with durable rust-resistant finish . . . are available arranged with either blower fan or propeller fan.



The BUSH line of water-savers, most complete in the industry, also includes:



'CDT' COPPER DECK COOLING TOWERS with all copper decking.
'IEC' INNER-FIN EVAPORATIVE CONDENSERS featuring patented inner-fin coils. Both units available with blower or propeller fan. Capacities from 3 to 90 Tons.



'PFC' PROPELLER FAN CONDENSERS — Two basic models, 2.2 Tons and 3.3 Tons can be combined by mounting in banks to obtain any desired tonnage.

'PS' PRESSURE STABILIZERS — automatically maintain satisfactory head pressure when air cooled condensers operate outside in low ambient temperatures.

Write direct for complete information or contact your experienced BUSH representative for valuable engineering and application assistance.

BUSH

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Heating Piping & Air Conditioning

Vol. 28 No. 3

(with which is merged the Aerologist)

Design, Installation, Operation
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and Public Buildings

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Published monthly by the Keeney Publishing Co., 6 N. Michigan Ave., Chicago 2, Ill. Telephone: STate 2-6916. Subscriptions: U.S. and possessions, $3.00 per year; Canada, Cuba, Mexico, Central America, South America. $4.00 per year; other, $6.00. Current copies, U.S. and possessions, 35c each; back copies, 60c each. January 1956 issue $1.50 per copy. For change of address, notify publisher and your local postoffice of both old and new addresses by the 8th of the preceding month. Member Audit Bureau of Circulations, Associated Business Publications, Inc., and Magazine Publishers Association, Inc. Heating, Piping & Air Conditioning is indexed regularly by Engineering Index, Inc., and Industrial Arts Index and is microfilmed by University Microfilms.

©1956 by the Keeney Publishing Co.
Entered as Second Class Matter May 18, 1929, at the Post Office at Chicago, Ill., U.S.A. under the Act of March 3, 1879. Additional entry at Mendota, Ill.

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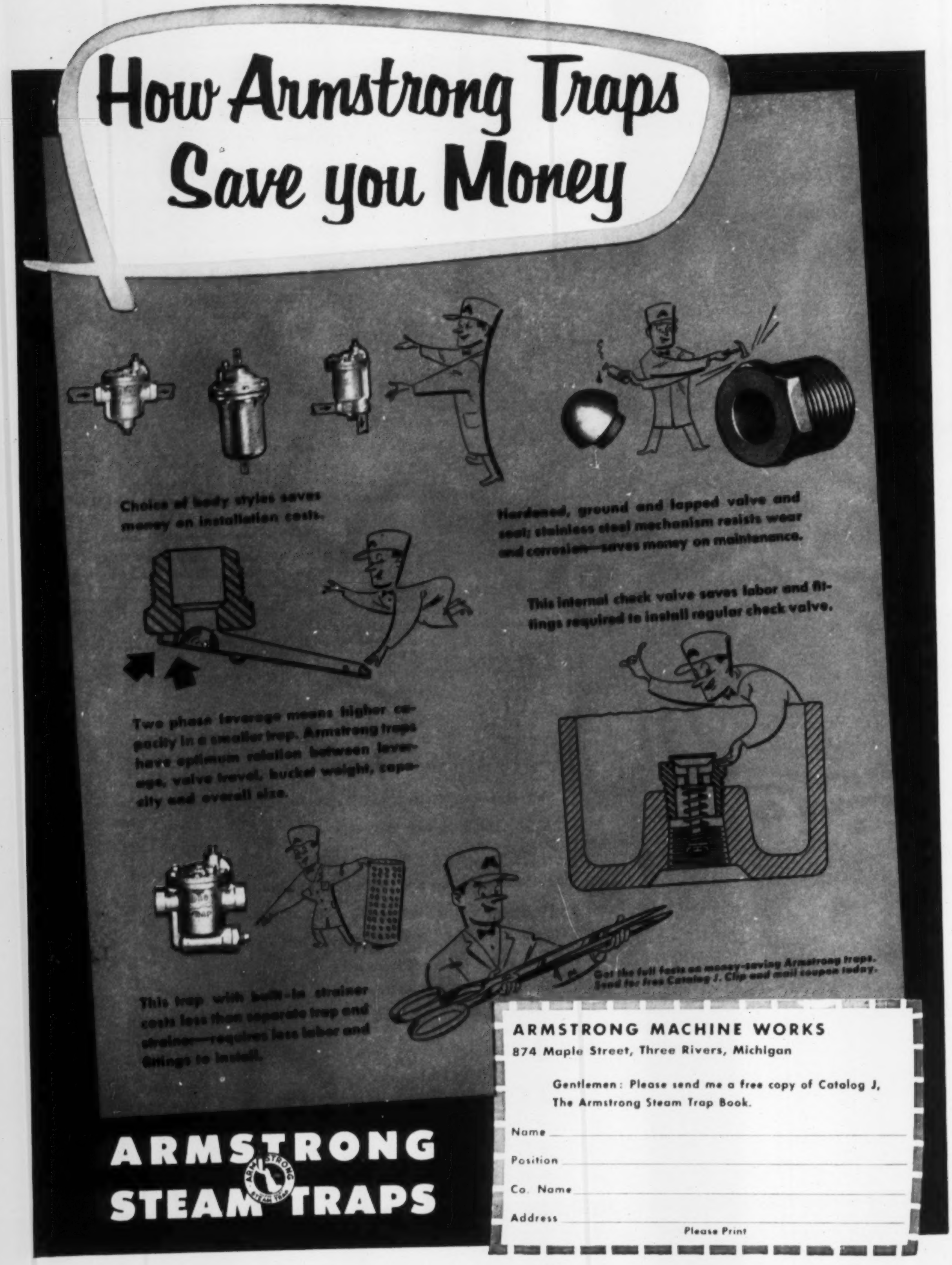

How Armstrong Traps Save you Money

Choice of body styles saves money on installation costs.

Hardened, ground and lapped valve and seat; stainless steel mechanism resists wear and corrosion—saves money on maintenance.

This internal check valve saves labor and fittings required to install regular check valve.

Two phase leverage means higher capacity in a smaller trap. Armstrong traps have optimum relation between leverage, valve travel, bucket weight, capacity and overall size.

This trap with built-in strainer costs less than separate trap and strainer—requires less labor and fittings to install.

Get the full facts on money-saving Armstrong traps. Send for free Catalog J. Clip and mail coupon today.

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ARMSTRONG MACHINE WORKS
874 Maple Street, Three Rivers, Michigan

Gentlemen: Please send me a free copy of Catalog J, The Armstrong Steam Trap Book.

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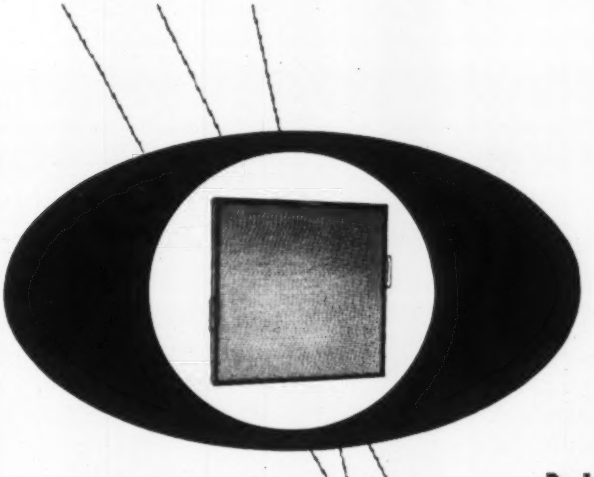


NOW—
you can be sure you are right

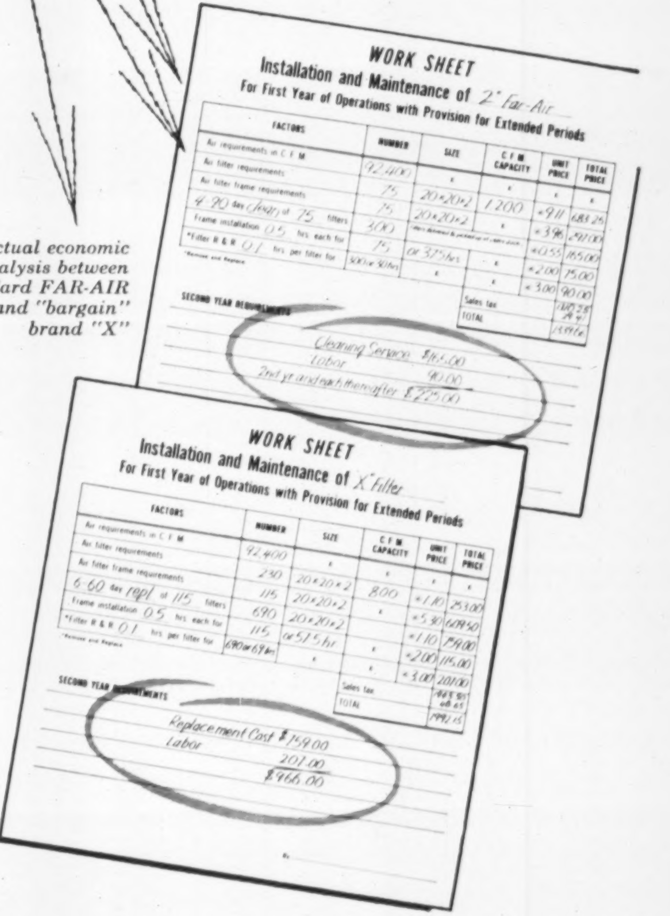
Because most filters are efficient at cleaning air, you are reasonably sure of getting a satisfactory job when you install an established make. The service life of your expensive air conditioning machinery and the comfort of your building depend on the ability of relatively low cost filters to do their job.

FARR Company, as one of the country's leading filter manufacturers, wants to insure that your are getting the most value out of your present filters, regardless of make. Therefore, they will send a field engineer who is an air filtration expert, to carefully analyze your air filters and submit a factual, written report like the one shown, on his findings. Often he can make suggestions that will greatly increase your filtration efficiency and save a substantial amount of money in operating costs.

FARR Company is making this service available to you on a no cost basis because it will increase your appreciation for the function of the often-neglected air filters. It will point out the importance of buying standard brand filters. It will in some cases result in sales for FAR-AIR filters . . . and that is important, too.

Why not try this service? It is factual, honest and subject to favorable comparison by any reputable manufacturer. Write today to Farr Company, P.O. Box 45187, Airport Station, Los Angeles 45, Calif.

An actual economic analysis between standard FAR-AIR filters and "bargain" brand "X"



WORK SHEET
Installation and Maintenance of 2" Far-Air
For First Year of Operations with Provision for Extended Periods

FACTORS	NUMBER	SIZE	C F M CAPACITY	UNIT PRICE	TOTAL PRICE
Air requirements in C F M	92,400	x	x	x	x
Air filter requirements	75	20×20×2	1200	@9.11	683.25
Air filter frame requirements	75	20×20×2	x	@3.96	297.00
4-90 day clean of 75 filters	300	*filters delivered & picked up at user's dock		@0.55	165.00
Frame installation 0.5 hrs each for	75	or 37.5 hrs	x	@2.00	75.00
*Filter R & R 0.1 hrs per filter for	300 or 30 hrs	x	x	@3.00	90.00
			Sales tax		1310.25 29.41
			TOTAL		1339.66

*Remove and Replace

SECOND YEAR REQUIREMENTS

Cleaning Service $165.00
Labor 90.00
2nd yr and each thereafter $225.00

WORK SHEET
Installation and Maintenance of "X" Filter
For First Year of Operations with Provision for Extended Periods

FACTORS	NUMBER	SIZE	C F M CAPACITY	UNIT PRICE	TOTAL PRICE
Air requirements in C F M	92,400	x	x	x	x
Air filter requirements	230	20×20×2	800	@1.10	253.00
Air filter frame requirements	115	20×20×2	x	@5.30	609.50
6-60 day repl of 115 filters	690	20×20×2		@1.10	759.00
Frame installation 0.5 hrs each for	115	or 57.5 hr	x	@2.00	115.00
*Filter R & R 0.1 hrs per filter for	690 or 69 hrs	x	x	@3.00	207.00
			Sales tax		1343.50 48.65
			TOTAL		1392.15

*Remove and Replace

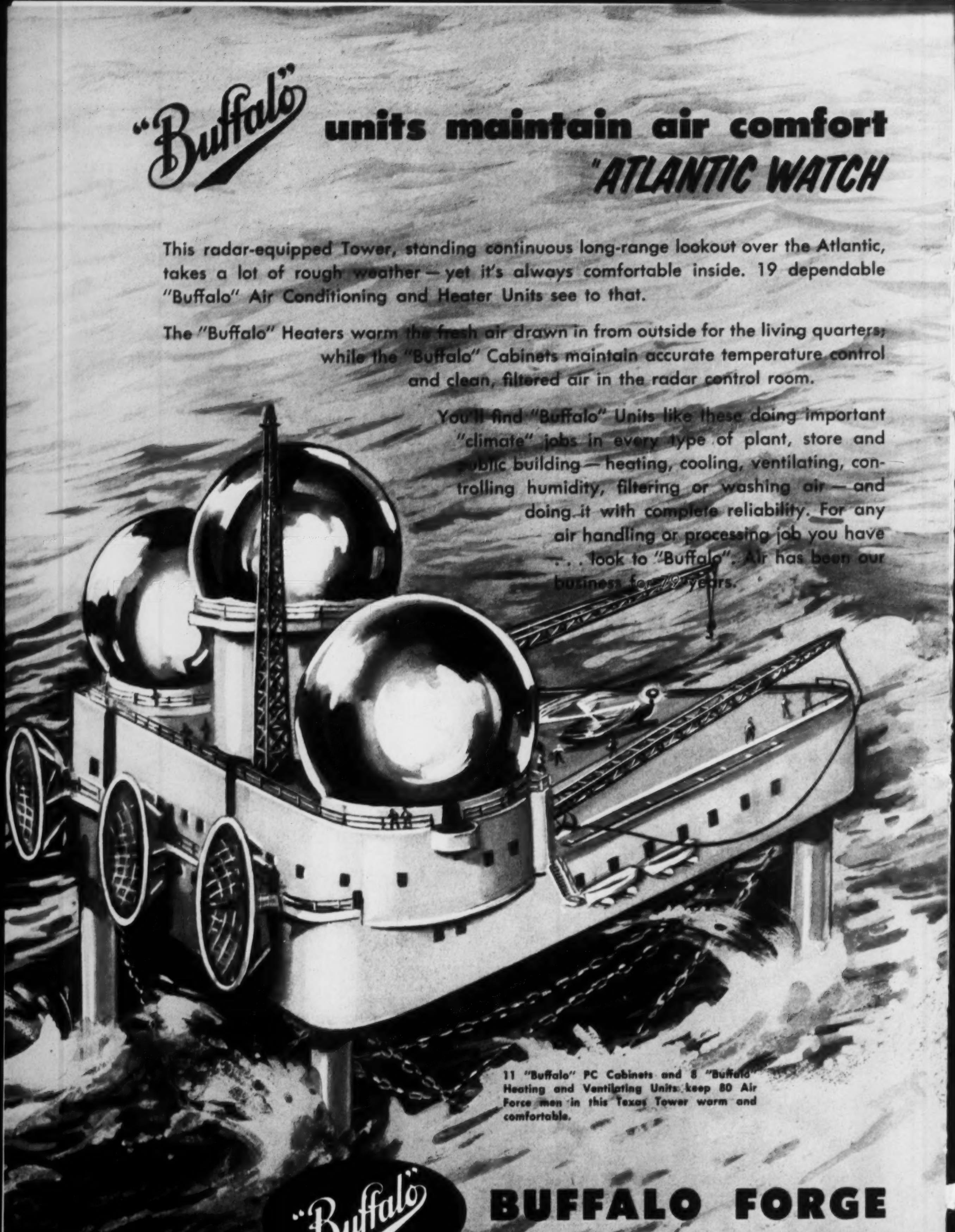
SECOND YEAR REQUIREMENTS

Replacement Cost $759.00
Labor 207.00
$966.00

By

ORIGINATORS OF FAR-AIR CERTIFIED FILTER SERVICE

FARR COMPANY
NO COMPROMISE ON QUALITY
Los Angeles, New York, Chicago
New Orleans



"Buffalo" units maintain air comfort
"ATLANTIC WATCH

This radar-equipped Tower, standing continuous long-range lookout over the Atlantic, takes a lot of rough weather — yet it's always comfortable inside. 19 dependable "Buffalo" Air Conditioning and Heater Units see to that.

The "Buffalo" Heaters warm the fresh air drawn in from outside for the living quarters; while the "Buffalo" Cabinets maintain accurate temperature control and clean, filtered air in the radar control room.

You'll find "Buffalo" Units like these doing important "climate" jobs in every type of plant, store and public building — heating, cooling, ventilating, controlling humidity, filtering or washing air — and doing it with complete reliability. For any air handling or processing job you have . . . look to "Buffalo". Air has been our business for 79 years.

11 "Buffalo" PC Cabinets and 8 "Buffalo" Heating and Ventilating Units keep 80 Air Force men in this Texas Tower warm and comfortable.

"Buffalo"

BUFFALO FORGE

BUFFALO,

Canadian Blower & Forge Co., Ltd.,

in our

TOWERS"

VENTILATING

AIR CLEANING

AIR TEMPERING

INDUCED DRAFT

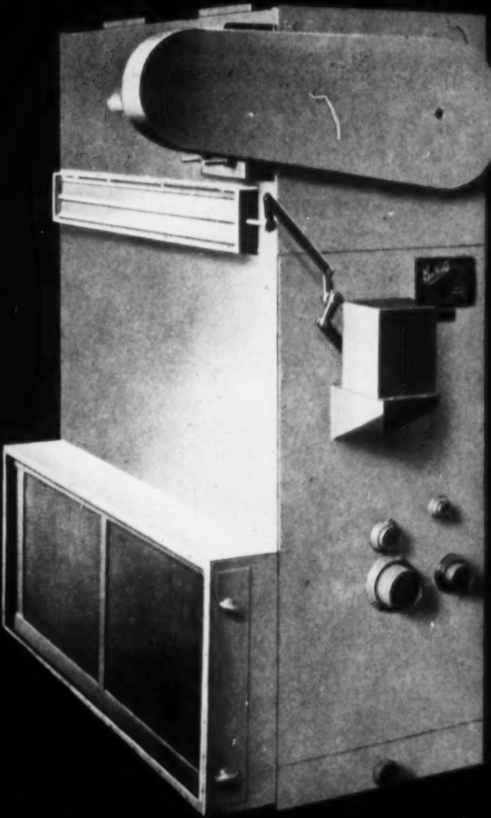
EXHAUSTING

FORCED DRAFT

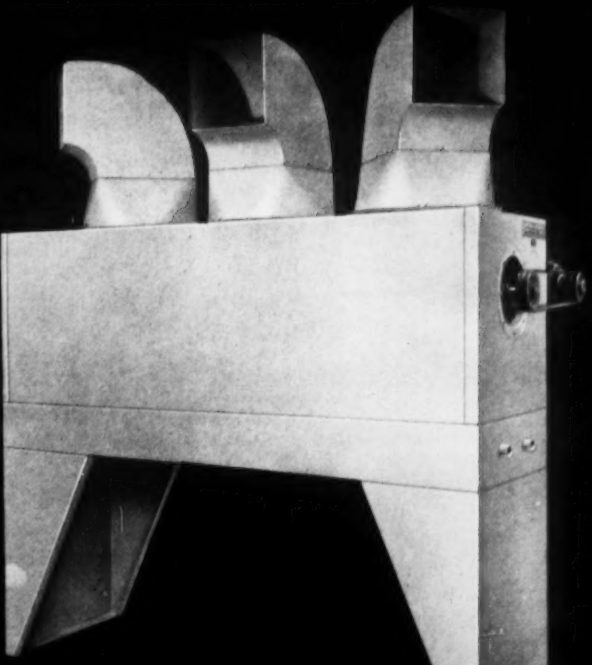
COOLING

HEATING

PRESSURE BLOWING



"Buffalo" PC Cabinets provide any desired combination of air conditioning functions. Write for Bulletin 3703.



Compact "Buffalo" Unit Heaters have built-in fans and swivel outlets. Write for Bulletin 3704.

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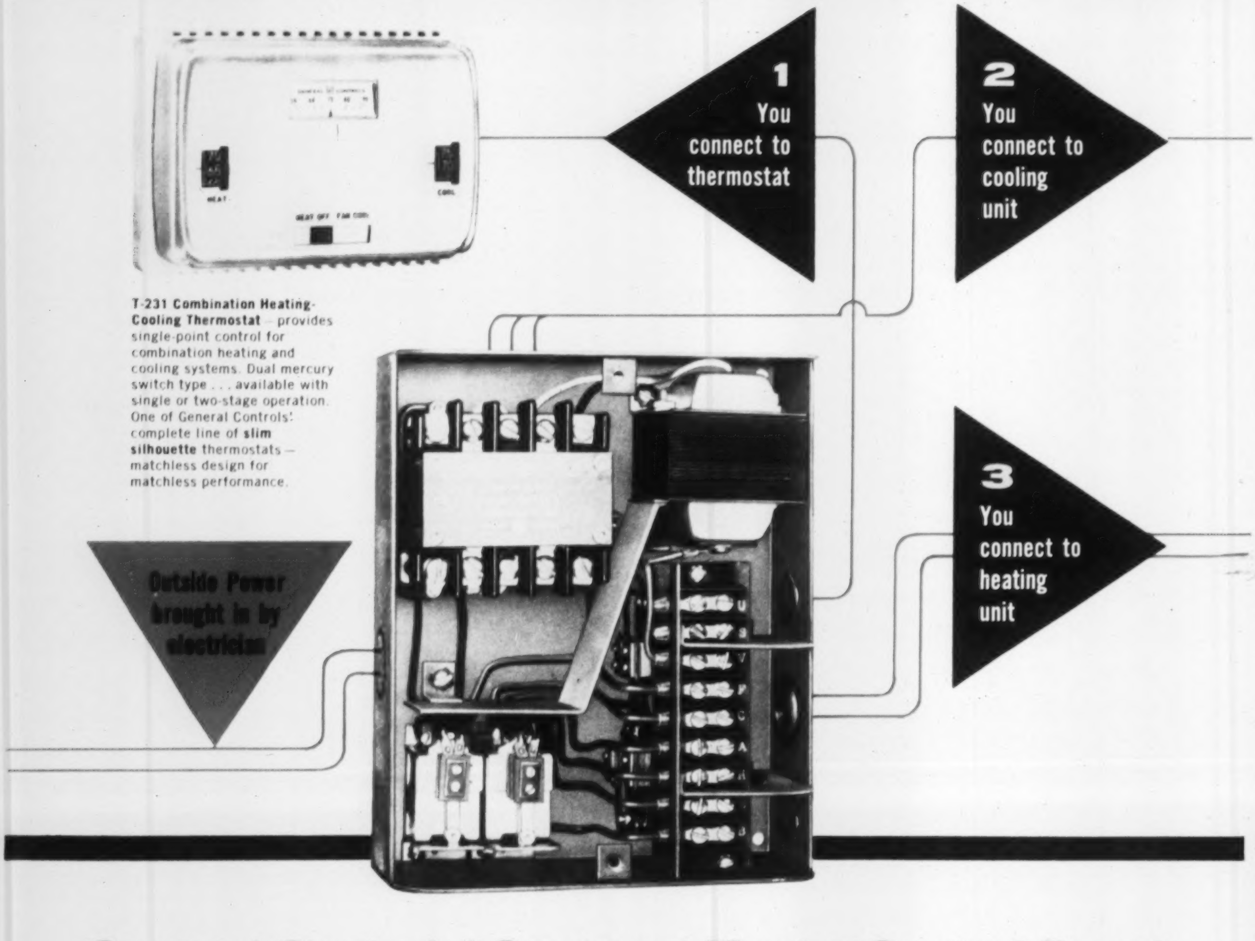
NEW YORK

Kitchener, Ontario

Make These 3

...to profit by the prewired simplicity of


1
You connect to thermostat
2
You connect to cooling unit
3
You connect to heating unit
Outside Power brought in by electrician
HEAT
COOL

T-231 Combination Heating-Cooling Thermostat — provides single-point control for combination heating and cooling systems. Dual mercury switch type . . . available with single or two-stage operation. One of General Controls' complete line of **slim silhouette** thermostats — matchless design for matchless performance.

General Controls' Compact Master Control Panel

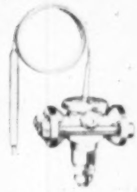
—provides a complete, prewired combination of all vital heating-cooling controls—motor relays, transformer, and pressure switches—simple to install as 1-2-3. Everything prewired to easily accessible terminal strips...one connection to either gas-or oil-fired heating units, interchangeably. High voltage terminals isolated, relay ratings up to 5 hp single-phase, or 10 hp three-phase.

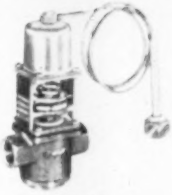
UL

Simple Connections

General Controls' Heating-Cooling Master Control Panel

A Complete Line of Controls for Cooling


V-203H Thermal
Expansion Valve


V-420 Water
Regulating Valve

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Stop Valve

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Pressure Switch

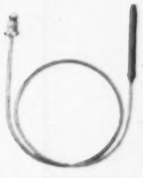
A Complete Line of Controls for Gas-Fired Heating

V-300 Low Pressure
Gas Regulator

B-50 Electric
Diaphragm Valve

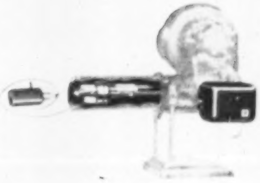
A-100G Thermo-
pilot Relay

L-44 Fan and
Limit Control


G-250 Pilot
Generator

A Complete Line of Controls for Oil-Fired Heating

5520 Stack-
Mounted Primary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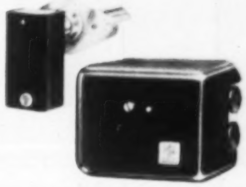
PerfXray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Stack–Burner-Mounted Primaries

General Controls the Nation's Most *Complete* Control Line

Your "extra profits" *begin* when you make a quick, one-stop call at your nearby General Controls wholesaler to pick up a *complete* control package for the entire job . . . *continue* as you complete a fast, clean installation. And remember, 5 plants, 7 regional warehouses, 40 branch offices – close as the phone – at *your* service.

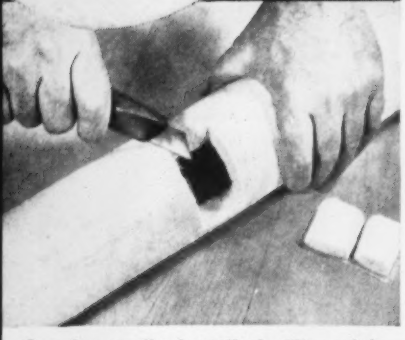
Five Plants
Iron Mountain, Michigan
Glendale, California
Burbank, California
Skokie, Illinois
Guelph, Canada

GENERAL CONTROLS
Manufacturers of Automatic Controls for Home, Industry, and the Military
FORTY BRANCH OFFICES SERVING THE UNITED STATES AND CANADA
PERFEX CONTROLS AND GENERAL CONTROLS

Now!
a new, molded silica insulation
developed by
Johns-Manville Insulation Research
✓Can't shrink...

Fibrocel alone offers all these advantages

- No shrinkage—eliminates gaping joints
- Resists compression—firm in structure
- Uniform dimensions—precision formed for exact fit
- Economical application—lightweight, easy to cut with a knife
- Thermal effectiveness
- Permanence—flame, rot, odor and vermin proof



Can be easily installed—Fibrocel is light, easily cut with a knife. Uniform dimensions assure tight, smooth joints and neat appearance.

Johns-Manville *first-in*

✓ *Resists deformation...*

✓ *Easier to apply...*

FIBROCEL®

PIPE INSULATION

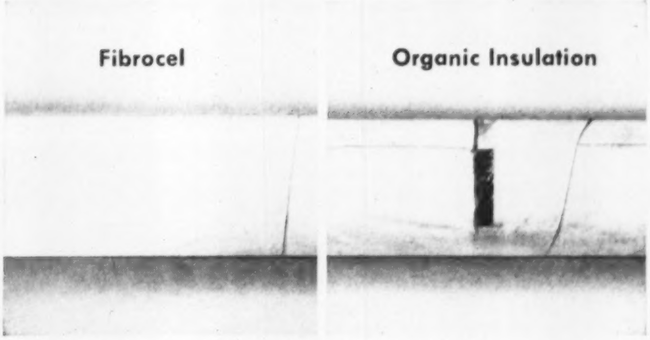
For plumbing, heating and air conditioning systems

● Johns-Manville Fibrocel is an entirely new concept in pipe insulation for the 35F to 300F temperature range. In the manufacturing process tiny particles of silica are exploded and expanded to form a cellular structure of "dead" air spaces. It incorporates in one material a combination of properties not found in any existing insulation for heating and plumbing service.

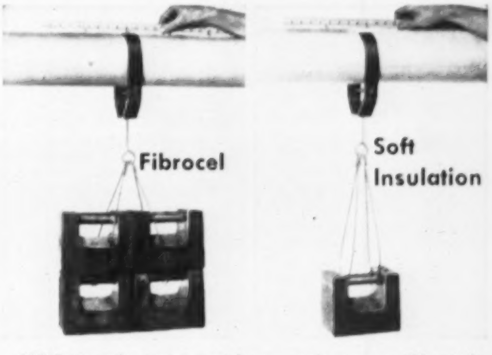
Fibrocel completely eliminates objectionable shrinkage caused by atmospheric changes. It permits no gaping, unsightly joints with accompanying heat leakage. Strong and firm in texture, Fibrocel resists deformation. Dimensionally uniform, it provides exact fit and neat appearance. Light in weight, it is readily handled. Fibrocel speeds application, keeps costs at a minimum.

This new insulation has been developed and tested in the world's largest insulation laboratory, located at the Johns-Manville Research Center. It has been proved in actual field installations. And it is backed by more than 96 years of Johns-Manville experience in insulation engineering.

Available now—Fibrocel is in commercial production. Architects, contractors, and engineers can secure full information from J-M District Offices. Or write for Brochure IN-155A, address Johns-Manville, Box 60, New York 16; in Canada, 565 Lakeshore Road East, Port Credit, Ont.



Joints stay tight—tests prove Fibrocel does not shrink, even after severe moisture exposure and service under continuous steam flow. Ordinary organic insulation shows substantial joint shrinkage after same test.



Withstands compression—tests prove Fibrocel suffers no deformation or compression even under 200-lb. weight. Softer type insulation shows marked deformation after being subjected to 50-lb. weight.

INSULATION MATERIALS · ENGINEERING · APPLICATION

FIRST... CARNES BROUGHT YOU *the finest in*

CEILING DIFFUSERS!

MODEL E J

A beautifully styled diffuser that features easy installation; fast, single balancing and adjusting; and a price that meets that of ordinary diffusers Deep ceiling plate prevents ceiling aging and eliminates the need for anti-smudge rings. Model E J (fully adjustable) and Model E (fixed cone) are both ideally suited for use in either exposed ductwork or for flush mounting on ceiling. Available in a complete range of sizes . . . all having the same number of cones to give a uniform appearance when various sizes are used in the same area.

THEN... CARNES BROUGHT YOU *the leaders in*

POWER ROOF VENTILATORS

MODEL C L Streamlined, low silhouette model with centrifugal fan. Precision-built for smooth, quiet, efficient operation. Outstanding features are: Maximum capacity through use of latest centrifugal wheel design; all housings of heavy gauge aluminum to eliminate maintenance and corrosion problems; heavy duty, ball-bearing protected motors; backwardly inclined, non-overloading centrifugal fan wheels; available in a large range of sizes to meet all ventilating requirements.

MODEL J Also designed for today's low parapet buildings, with all-aluminum spun housings for elimination of corrosion and maintenance problems. Model J features include: Centrifugal fan wheels statically and dynamically balanced; heavy duty precision pillow block and drive; quiet operation through use of specially designed vibration isolators.

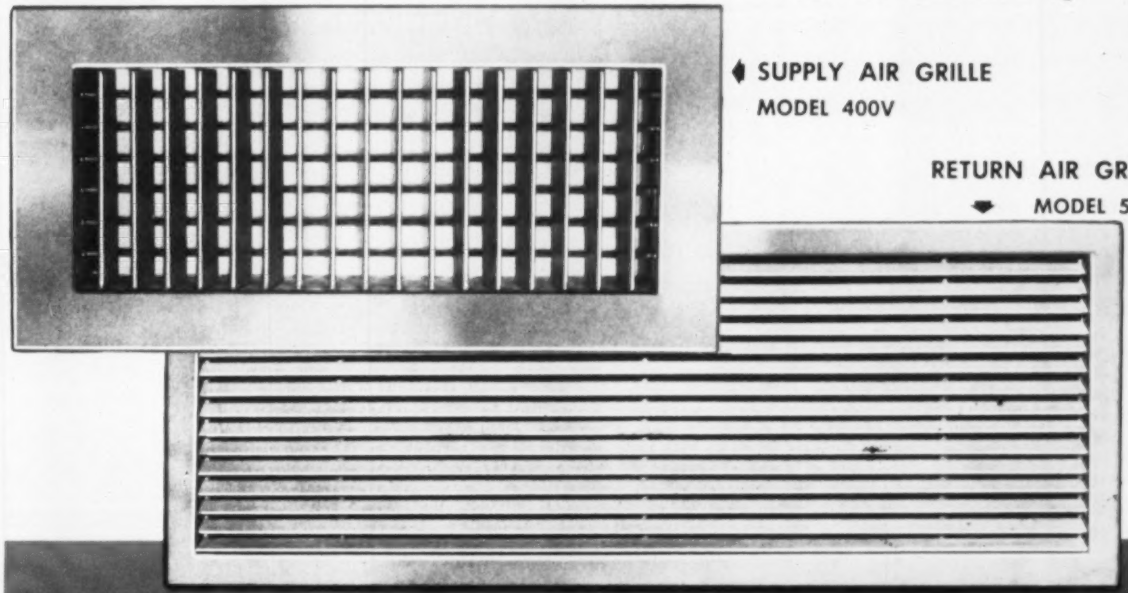
Of course, all Carnes Power Roof Ventilators carry the P.F.M.A. label, your guarantee that actual ratings conform with published ratings.

Certified Ratings
PFMA

NOW. . . FROM CARNES

a great new line of

REGISTERS AND GRILLES!



Yes, now . . . and new . . . from Carnes . . . a complete line of registers and grilles . . . all backed by the same expert designing, engineering, and manufacturing methods that assure finest quality. There's a model and a size for every specification — all are available in either steel, aluminum or stainless steel. All are equipped with streamlined hollow blades. All Carnes registers can be furnished with either an opposed blade damper or a multi-blade damper, both face-operated. For a fine, varied line that offers quality and economy — specify Carnes grilles and registers!

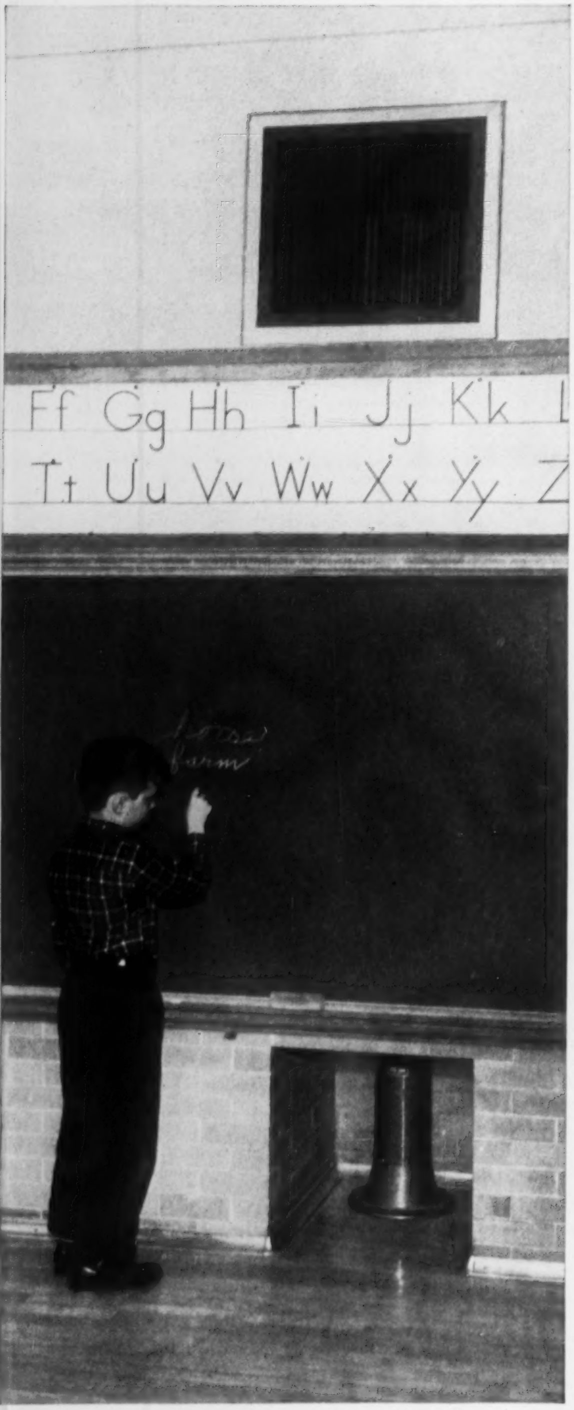
A COMPLETE LINE TO CHOOSE FROM

REGISTERS		GRILLES	
SUPPLY AIR	RETURN AIR	SUPPLY AIR	RETURN AIR
MODEL 100V Single deflection, adjustable vertical face bars and blades.	MODEL 500V Adjustable horizontal blades and vertical face bars.	MODEL 300V Single deflection, vertical adjustable face bars.	MODEL 550V Vertical bars set straight or at 45° angle.
MODEL 100H Single deflection, adjustable horizontal face bars, vertical blades.	MODEL 500H Adjustable horizontal blades and horizontal face bars.	MODEL 300H Single deflection, horizontal, adjustable face bars.	MODEL 550H Horizontal bars straight or set at 45° angle.
MODEL 200V Double deflection, adjustable vertical face bars, vertical blades, horizontal rear bars.		MODEL 400V Double deflection, vertical adjustable face bars and horizontal rear bars.	
MODEL 200H Double deflection, adjustable, horizontal face bars and vertical rear bars and blades.		MODEL 400H Double deflection, horizontal, adjustable face bars and vertical rear bars.	

Send for
CATALOG
with full information on Carnes new registers and grilles.

CARNES CORP.
VERONA, WISCONSIN

How new heating and ventilating system



Dunham VARI-AIR Unit, concealed in mixing flue behind blackboard, mixes fresh and recirculated air—silently diffuses it to classroom through overhead grille.

Dunham VARI-AIR designed to help the "hard pressed" budget... and save valuable floor space

SCHOOL construction costs can't go anywhere but down when Dunham VARI-AIR heats and ventilates classrooms. This new and simple system satisfies all health and comfort standards . . . does it at a cost that meets with the full approval of any school board member.

In addition to healthful and silent heating and ventilating, VARI-AIR puts school air conditioning within easy financial reach of school construction budgets . . . should it be desired. This optional use of VARI-AIR can be economically provided for at the time the system is installed.

Offers Numerous Advantages

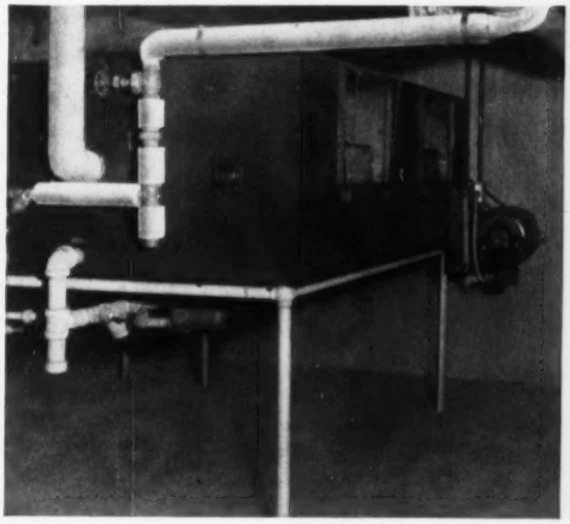
Lower Costs: Dunham VARI-AIR eliminates need for in-the-room cabinet ventilators . . . provides greater savings in classroom heating construction costs. Total absence of complex controls saves both first and maintenance costs.

Minimum Temperature Variations: Dunham's centralized temperature control system holds room temperatures within prescribed limits by automatically compensating for weather change and heat loss.

Space Saver: No floor space in classroom is given over to either heating or ventilating with a Dunham VARI-AIR system.

cuts schoolroom construction costs

Dunham Finned-Pipe Radiation runs along outside walls, under windows to eliminate chilling downdrafts, save premium classroom floor space.



Dunham Heating and Ventilating Unit pulls in outside fresh air and tempers, filters and discharges it through a tunnel or ceiling plenum to VARI-AIR Units.

How VARI-AIR Operates

Only three primary parts to the system. VARI-AIR Units are concealed in wall space, mix fresh and recirculated air and diffuse it into classrooms.

Heating and Ventilating Unit—generally one to the entire system—pulls in fresh outside air, tempers, filters and discharges it through a tunnel or ceiling plenum to the VARI-AIR Unit.

Radiation — Dunham THERMO VECTOR® "along-the-wall" radiation saves floor space and provides all necessary heat whether used with steam or hot water.

For complete information, contact any Dunham Representative or mail the coupon.

DUNHAM
CONTROL PANEL
C. A. DUNHAM CO.
DUNHAM

Dunham VARI-VAC® Temperature Controls provide centralized, one-man operating station for *all* system settings and remote control readings. This electronic "brain" enables system to save up to 40% on fuel.

DUNHAM®

HEATING & COOLING EQUIPMENT

RADIATION • CONTROLS • UNIT HEATERS • PUMPS • SPECIALTIES

C. A. DUNHAM COMPANY • CHICAGO • TORONTO • LONDON

C. A. DUNHAM COMPANY
Dept. HPAC-3, 400 W. Madison Street
Chicago 6, Illinois
Please send VARI-AIR literature.

Name ____________________

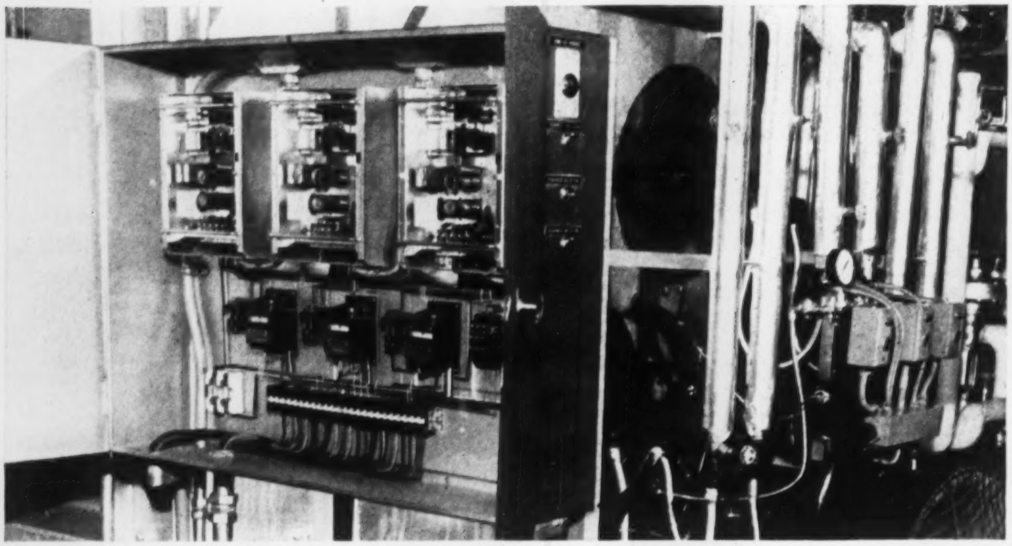
Company ____________________

Address ____________________

City ____________ Zone ______ State ____________

a fireye Interlock System went in AFTER THE EXPLOSION . . .

Back Up Your Boiler Operator with Safeguards that



How FIREYE covers every step in the firing cycle —

PREVENTS hurrying or skipping steps essential to safe operation

PREVENTS light-off until combustion chamber and passages are purged clean

BLOCKS main fuel supply until pilot is proved at the right point for light-off

SHUTS OFF fuel if main flame does not stabilize within the trial-for-ignition period

SHUTS OFF fuel and sounds alarm if the flame goes out during the firing period

THE RESULT OF 1 SLIP

IN 15 YEARS OF PERFECT PROCEDURE

Cost of new boiler — $35,000 . . .
Cost of lost production — much more

FOR 15 YEARS a well-designed boiler and an experienced and thoroughly competent operator were enough for safety in this large New England plant. Of course, there was a "standard" type of burner safeguard present as well.

THEN, came one of the slips that prove no human is infallible. The operator attempted to light off a second burner from one already firing. The "safeguard" was too slow . . . there was a flash . . . the boiler was destroyed . . . production was shut down for months.

Protect Every Stage of Light-Off and Firing

Your boiler operator knows how great the need is for an assistant like Fireye. He knows that incorrect light-off or flame failure can occur in even the most modern burner installations. He knows that operators are only human, that they can slip. He is keenly aware that in an emergency no man can always act fast enough to avert disaster.

Fireye is the proved, complete, factory-integrated system that foresees and forestalls hazards of fuel burning in multiple-burner installations. With its Firetron "eye" that constantly monitors all stages of the firing cycle, Fireye acts within 2 to 4 *seconds* of the start of trouble. Its system of timers, interlocks, and shutoff valves automatically supervises every operating step.

The Fireye organization brings to your problems a knowledge and experience in fuel burning control that is without equal. It benefits you whenever Fireye engineers, located throughout the country, come in to survey your situation . . . supervise installation of Fireye equipment . . . check out the installation, and train your operating personnel.

Fireye alone can serve you so completely — and your need for its services may be greater than you realize. Begin TODAY, by mailing the coupon for your copy of a non-technical bulletin that explains why most fuel-burner explosions happen, and how Fireye prevents them.

ECA fireye

Other ECA Divisions: Photoswitch Division • Fireye Division • Marine Division • Business Machines Division • Photoconductor-Transistor Division • Military Division

Protect Your Boiler NOW — send for this

COMBUSTION CONTROL DIVISION • ELECTRONICS CORPORATION OF AMERICA
Dept. C13-3, 718 Beacon Street, Boston, Mass.
In Canada, write Electronics Corporation of America (Canada) Limited, Box 111, 98 Advance Road, Toronto 18.

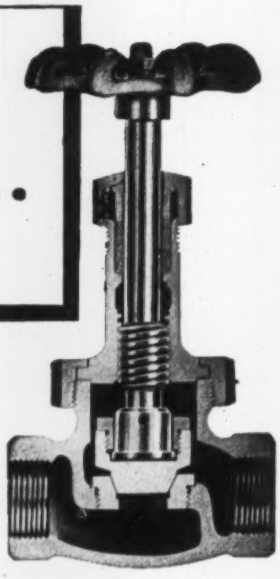
Send Bulletin CP21 on Flame Failure Explosions

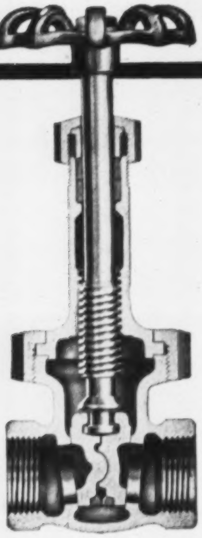
NAME

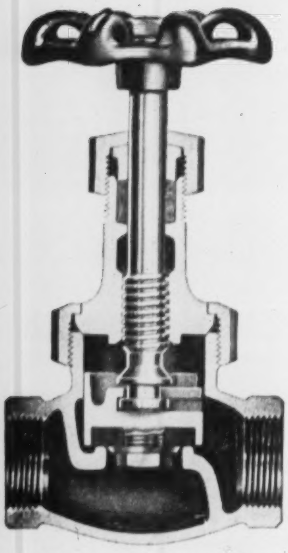
FIRM

ADDRESS

Walworth bronze valves...


Walworth No. 225P Globe Valve
500 Brinell Seat and Disc


Walworth
No. 29 Gate Valve


Walworth No. 95 Globe Valve
Re-New Disc

built to give dependable trouble-free service on all recommended jobs

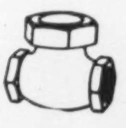
Walworth No. 95 Bronze Globe Valves (Angle Type: No. 96) are recommended for service where throttling is not required. They are rated at 150 psi working steam pressure, 500F; 300 psi cold water, oil or gas. The improved renewable disc and lock-on, slip-off disc holder — an original Walworth development—saves time and trouble. This valve can be repacked under pressure when fully opened. All parts are designed to give maximum service and strength.

Walworth No. 29 Bronze Gate Valves are rated at 200 psi working steam pressure, 550F; 400 psi cold water, oil and gas. These valves have rising stems and integral seats. Sizes 2-inch and smaller have union bonnets; sizes 2½ and 3-inch have bolted bonnets. Valves up to and including **¾-inch** have solid wedge discs; 1-inch and larger have split wedge discs. These valves can be repacked under pressure when fully opened.

Walworth No. 225P Bronze Globe Valves (Angle Type: No. 227P) are rated at 350 psi working steam pressure, 550F; and 1000 psi non-shock service on cold water, oil and gas. The stainless steel, plug type seat and disc — heat treated to 500 Brinell — can be closed on sand, slag, scale and similar floatage, without injury to the seating surfaces. They are the longest wearing, TOUGHEST bronze valves you can buy.

For full information about Walworth Quality Bronze Valves, see your Walworth distributor, or write:

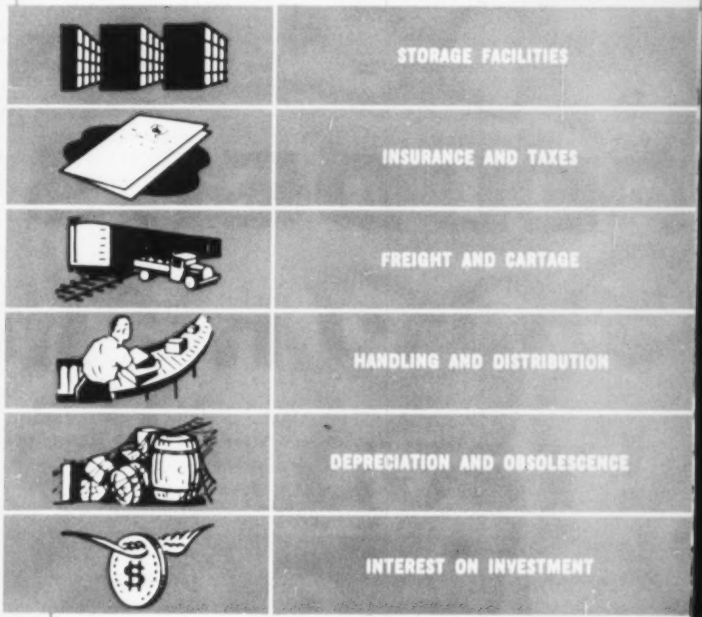
WALWORTH
valves and fittings
60 EAST 42nd STREET NEW YORK 17, N. Y.



It Costs You
A Minimum of
$120.00* A YEAR
to Stock
$1000.00 WORTH
of Industrial Supplies . . .
YOUR JOBBER
does it for You
FREE

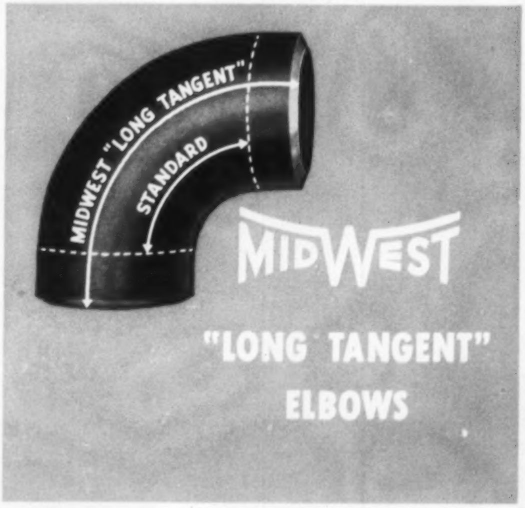
* Minimum cost determined from survey made by "Industrial Distribution."

STOCK CARRYING EXPENSES


STORAGE FACILITIES
INSURANCE AND TAXES
FREIGHT AND CARTAGE
HANDLING AND DISTRIBUTION
DEPRECIATION AND OBSOLESCENCE
INTEREST ON INVESTMENT

Stock carrying costs are worth the careful consideration of every company in industry. The figures here are the findings of INDUSTRIAL DISTRIBUTION magazine from an analysis of plant cost studies. But this saving is only one of numerous advantages the industrial jobber offers you. Others are: time-saving in delivery, ordering convenience, technical assistance, etc.

Your MIDWEST Jobber Can Save You Money on Welding Fittings


MIDWEST "LONG TANGENT"
STANDARD
MIDWEST
"LONG TANGENT"
ELBOWS

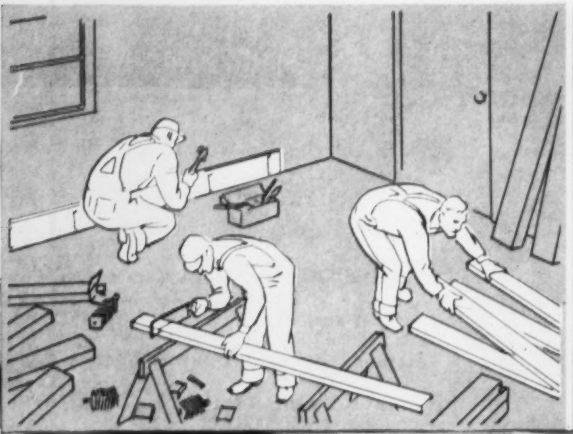
In addition to the savings indicated above, the Midwest jobber offers you a substantial further saving in Midwest "Long Tangent" Elbows. These give you from 21% to 42% more elbow *for the same price* and permit better piping design. Ask our jobber for Catalog 54 to get all the facts.

7407

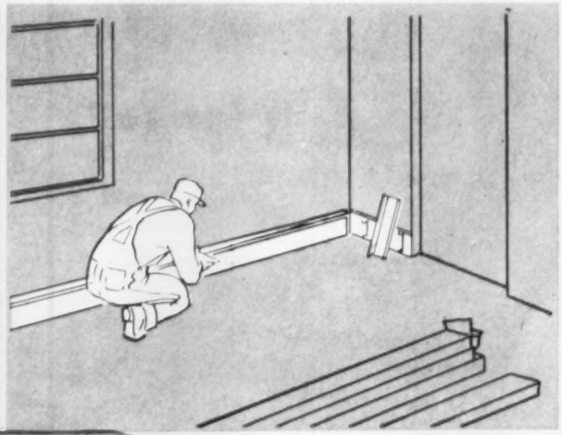
MIDWEST PIPING COMPANY, INC.
Main Office: 1450 South Second Street, St. Louis 4, Mo.
Plants: St. Louis, Passaic and Los Angeles
Sales Offices:
New York 7—50 Church St. • Chicago 3—79 West Monroe St.
Boston 27—426 First St. • Los Angeles 33—520 Anderson St.
Houston 2—1213 Capitol Ave. • Tulsa 3—224 Wright Bldg.
Cleveland 14—616 St. Clair Ave. • Miami 34—2103 Le Jeune Rd.
STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

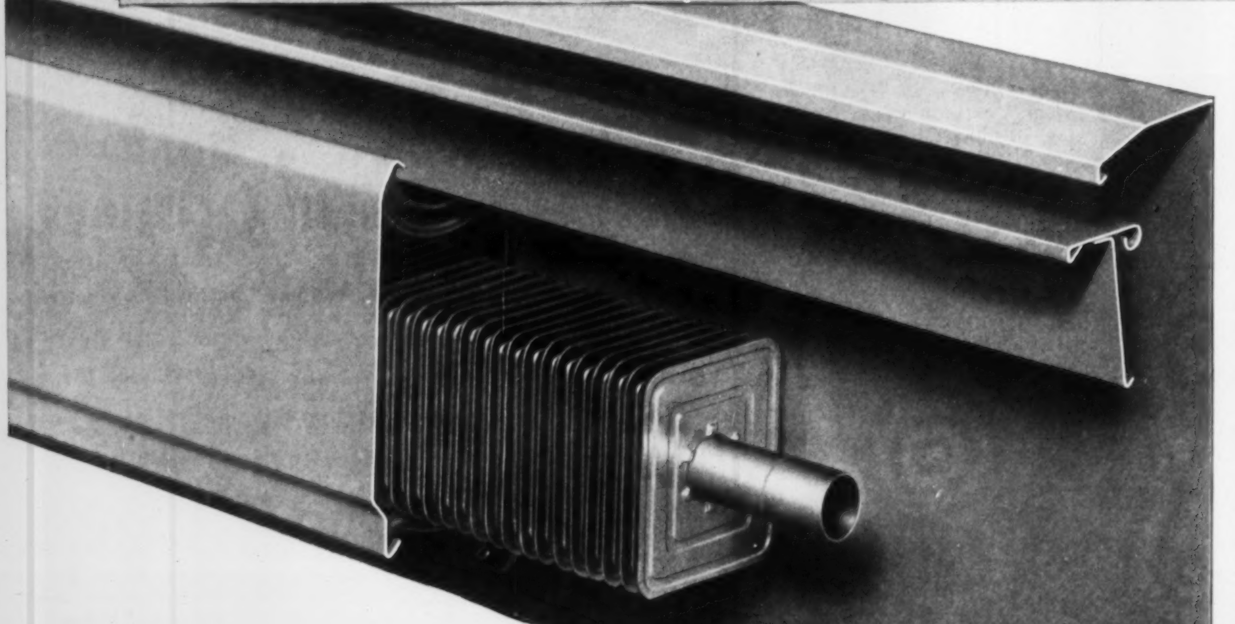
Big Savings
FEDDERS "made to
manufactured

Are You Wasting Hours? Wasting Dollars? Measuring, cutting, fitting baseboard units on site consumes needless hours. According to an independent study, these jobs consume up to 18% of total baseboard installation time.



Save the "Made-to-Measure" Way. Fedders Baseboard is precut to your exact requirements when it is delivered; marked for individual rooms. Cuts installation time to a minimum. Eliminates left-over pieces which add needless cost.





Write for descriptive literature and installation data on Fedders Convectors, Unit Heaters, Wall Fin and the new remote heats-and-cools Fedair units.

for Big Heating Jobs

measure” baseboard to your blue prints

AT NO EXTRA COST!

if you are installing heating in 50 homes or more

here is the big news you have waited for

▶ Here's the simplest way ever to slash labor costs on big heating jobs:

Fedders “Made-to-Measure” Baseboard Radiation can be manufactured to your blueprints at the same low per-foot cost as for standard sizes.

You slice hours from each installation because the costly time-consuming job of hack-sawing standard baseboard units to fit individual rooms has already been done for you when the material is delivered to the site. Each piece of baseboard is individually packed and clearly marked for the room in which it is to be installed. So you'll save additional hours in staging the jobs. You pay for only as much baseboard radiation as required for the actual job.

Fedders is set up to put your job in production right away to meet your schedules if your baseboard order covers 50 or more dwelling units . . . private homes or individual apartments in mass housing projects. You may specify Fedders deluxe Beauty Base Radiation with movable vane damper, or the new low-cost “L” Series Baseboard Radiation.

Specially manufactured to your prints under Fedders “Made-to-Measure” Plan . . . or in standard sizes for smaller jobs, all Fedders Baseboard Radiation has time-saving built into its basic design: Nail starts speed installation of a one-piece back-and-top casing . . . joint covers and end pieces snap into position without screws or other fastenings . . . fin-tube heating elements rest on built-in brackets and are secured by snap-on wire hangers . . . expanded ends permit fast joining to adjacent tubes without couplings.

All are die-formed to present smooth, eye-pleasing contours without sharp corners and angles. And all offer high heat output; enable you to provide true perimeter heating on outside walls. Flexible hangers eliminate expansion noises.

Fedders baseboard . . . and Fedders new “Made-to-Measure” Plan will go a long way toward closing the small cost gap between hot-air and efficient, saleable hot water heating systems. Call your Fedders representative today or mail the coupon below.

FEDDERS-QUIGAN CORPORATION
Heating Division
LALOR & HANCOCK STREETS, TRENTON 7, N. J.

HEATING DIVISION, Dept. HP-3
FEDDERS-QUIGAN CORPORATION
Lalor and Hancock Streets, Trenton 7, N. J.

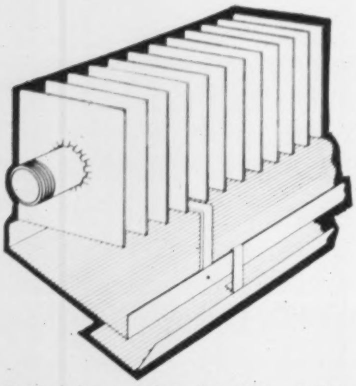
Please have your representative call right away to figure my costs . . . and savings . . . on “Made-to-Measure” Baseboard for an important _____-unit heating job.

Name ______________________________

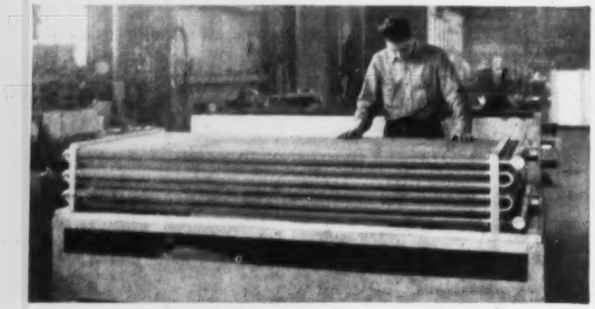
Firm ______________________________

Address ______________________________

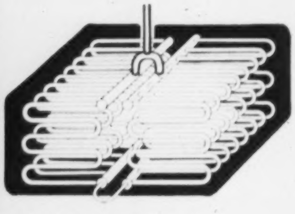
City ____________________ **State** ________



Frick Patented square-finned steel pipe is preferred for cold storages, freezers, etc. Seven-inch fins, spaced 1" or 1½", are bonded under tons of pressure, then galvanized.



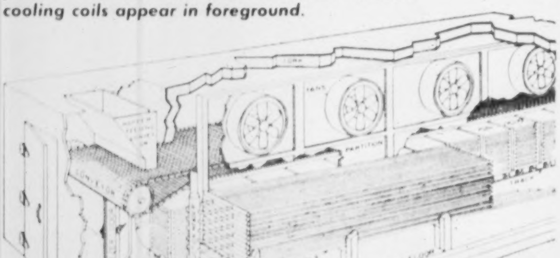
Spiral-finned coils are built in any style wanted. Pipe is ¾" steel: assembly is hot-dip galvanized.



Above: Type VW coils have many uses, offer many advantages.

Left: Patented direct-expansion Frick coils more than double the production of synthetic rubber reactors.

Below: Quick-freezing tunnel equipped with both conveyor and push trucks, able to handle ANY foods. Inclined cooling coils appear in foreground.



Butt-welded coils are stronger than the original pipe.

TRADE FRICK MARK®

COOLING COILS

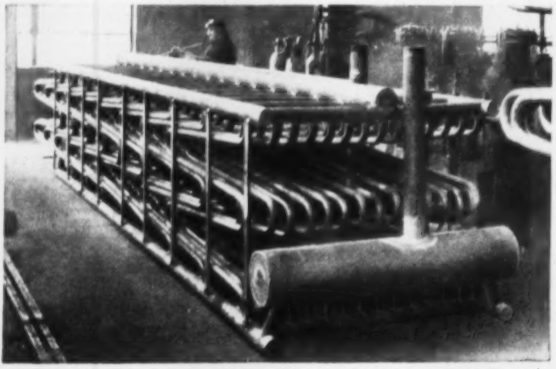
Are furnished in any style, any size, for any refrigerant: finned or bare pipe, welded or threaded, black or galvanized. Many exclusive types available.

Frick coils are designed, built, and installed . . . COMPLETELY ENGINEERED . . . to meet your exact needs most effectively.

Get the full facts and figures now: write for bulletins and estimates: address

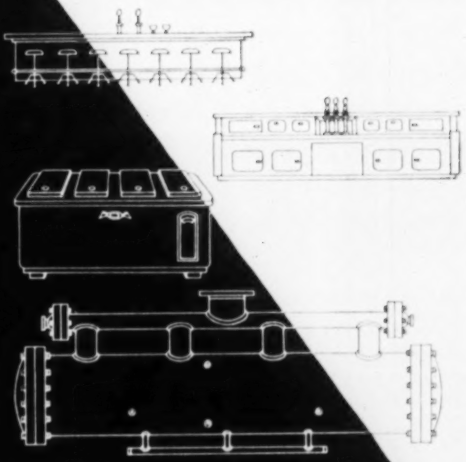
DEPENDABLE REFRIGERATION SINCE 1882
FRICK CO.
WAYNESBORO, PENNA. U.S.A.

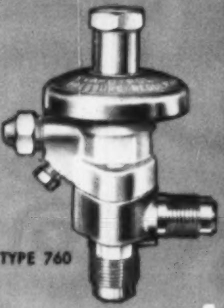
Below: Vertiflow coils are unexcelled for chilling water or the brine in ice tanks.



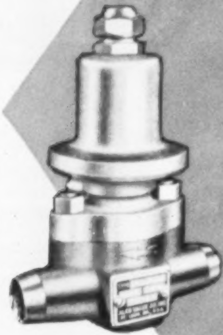
SAVE
MONEY

keep your coolers from busting

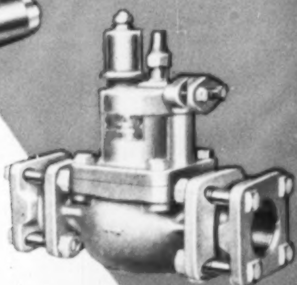




TYPE 760



TYPE 435



TYPE EPR

prevent freeze-up with

Alco

EVAPORATOR
PRESSURE
REGULATORS

They hold evaporator pressures to a predetermined point when the load changes. Available for any size water cooler—from drinking fountains to large industrial installations.

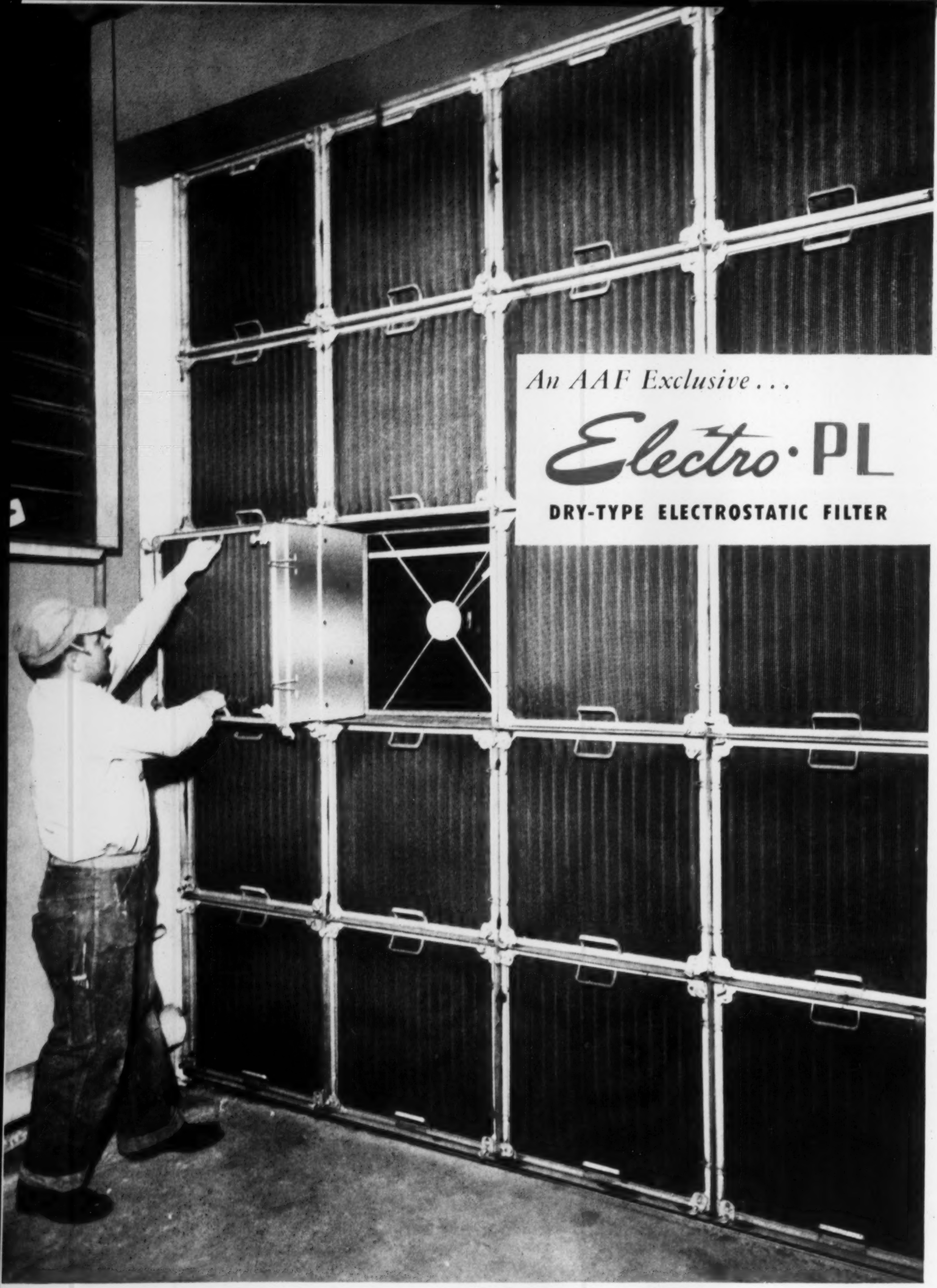
**ENGINEERED
for service
for life**

SEE YOUR ALCO WHOLESALER

ALCO

Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

ALCO VALVE CO.
861 KINGSLAND AVE. • ST. LOUIS 5, MO.


An AAF Exclusive . . .
Electro·PL
DRY-TYPE ELECTROSTATIC FILTER

Operator demonstrates simple removal of Electro-PL filter element for servicing.

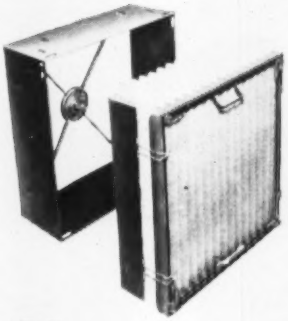
Inexpensive Airmat media is quickly renewed by means of mechanical loader (illustrated) or manual loader.

TWICE THE EFFICIENCY

of ordinary filters

AT LOW INITIAL COST

Rear view of Electro-PL installation showing electrical connections to individual cells.

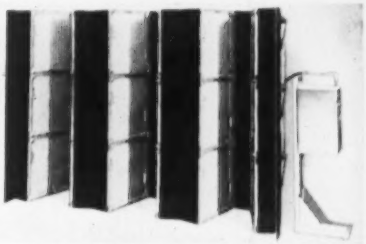


The only filter that effectively combines Dry Filtration with Electronic Action!

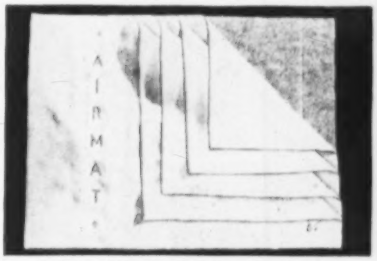
HERE'S the one and *only* air filter designed specifically for use where better-than-normal air cleaning is needed at lowest possible cost.

The Electro-PL employs electronically-charged Airmat media. And with every renewal of the media, the Electro-PL becomes essentially a new filter. Unit construction simplifies installation —no water or sewer connections.

Even a power failure can't stop *this* electrostatic filter! The Airmat media alone will maintain efficient air filtration. For complete product information, call your nearby AAF representative or write direct for Electro-PL Bulletin 257.



Electro-PL units may be installed in space-saving V arrangements.



5 ply Airmat filtering media is composed of porous, tissue-thin sheets of cellulose fibers.

AAF Dust Control Equipment

Illinois Steam Heating Specialties

AAF **American Air Filter**

COMPANY, INC.
373 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

herman nelson

BETTER AIR IS OUR BUSINESS

Herman Nelson Unit Heaters

Herman Nelson Unit Ventilators

Pipe for your next job in a jiffy!

7 Points of uniform goodness in YOUNGSTOWN PIPE

uniform ductility
uniform lengths
uniform threading
uniform weldability
uniform wall thickness and size
uniform strength and toughness
uniform roundness and straightness

●You get quick service when you order steel pipe from your Youngstown Distributor. His complete stock and speedy delivery assure your getting pipe **on time**. No need for you to carry excess pipe inventory—or put up with costly job delays because of lack of pipe; just 'phone your nearby Youngstown Distributor.

Youngstown

QUALITY
YOUNGSTOWN
SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices: Youngstown, Ohio - District Sales Offices in Principal Cities

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES

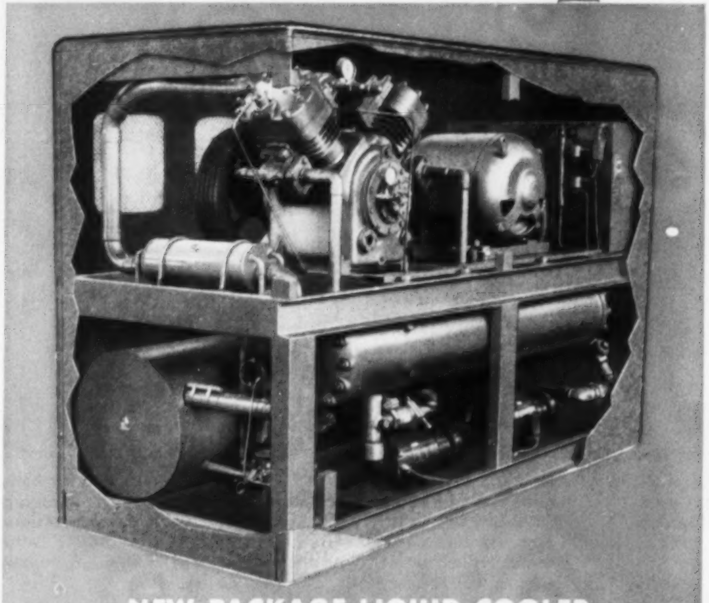
Build your own or use this

COMPLETE package Liquid Cooler

The comprehensive line of B&G Cooling Equipment enables you to assemble individual components on the job, or to take advantage of completely self-contained units. The B&G Package Liquid Cooler illustrated here is pre-engineered and assembled at the factory. Your only responsibility is to place the unit in position and connect it into the system. Easy to move if ever necessary.

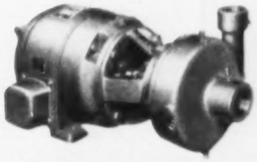
B&G Cooling Equipment offers an array of features well worth your critical examination. When you specify B&G products throughout, you are assured of equipment known for quality—with a single manufacturer's responsibility for satisfactory operation.

Write today for a complete file of B&G Cooling Equipment literature.

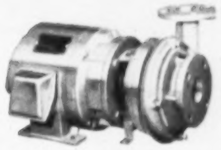


NEW PACKAGE LIQUID COOLER

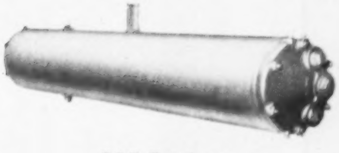
A complete cooling unit for homes, apartments, commercial and industrial buildings. Low pressure drop through evaporator—non-recycling pump down—integrated electrical control system—complete wiring, are a few of many outstanding features. Send for Bulletin HB-755.



B&G Series 1522 Pumps

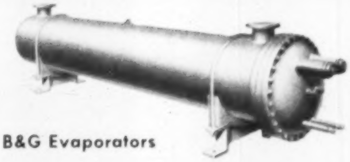


B&G Series 1531 Pumps



B&G Condensers

B&G Liquid Receivers



B&G Evaporators

B&G Heat Exchangers

STOCK ITEMS FOR FAST SERVICE

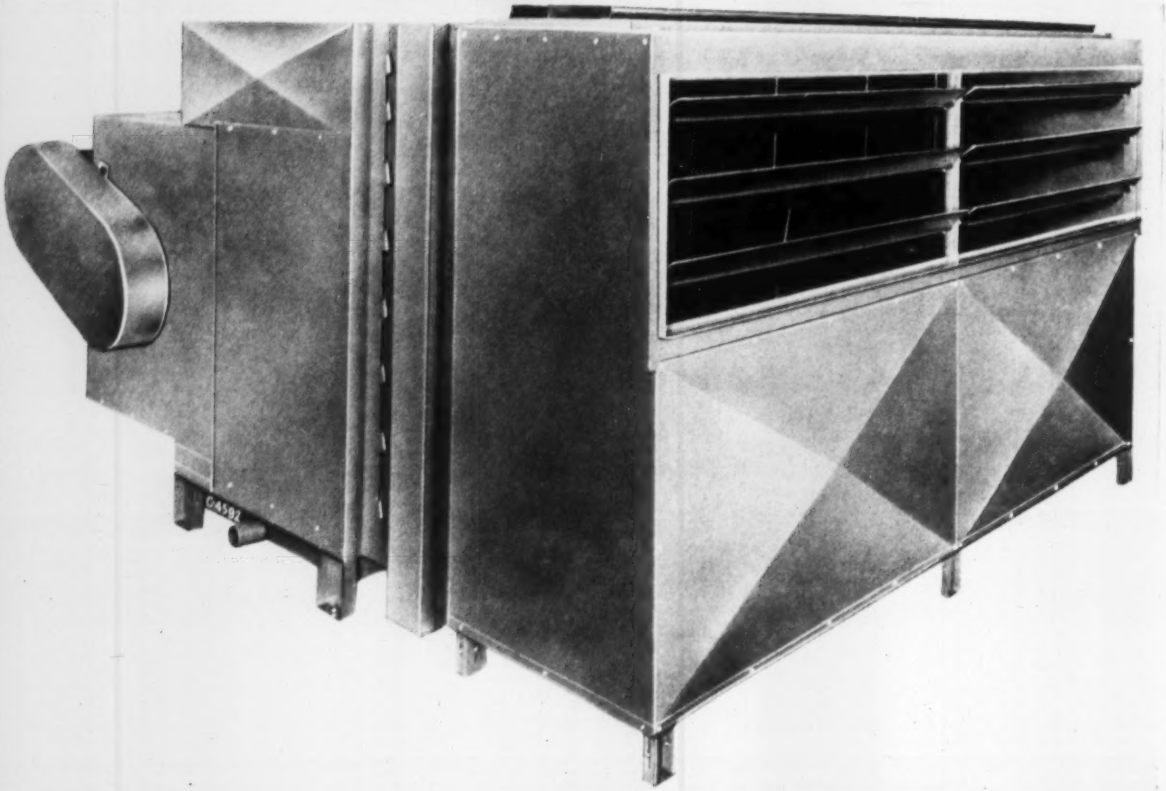
For your convenience, a stock of most commonly used sizes of Centrifugal Pumps, Condensers, Liquid Receivers, and Heat Exchangers are kept in factory stock for immediate shipment. Send for literature.

BELL & GOSSETT COMPANY

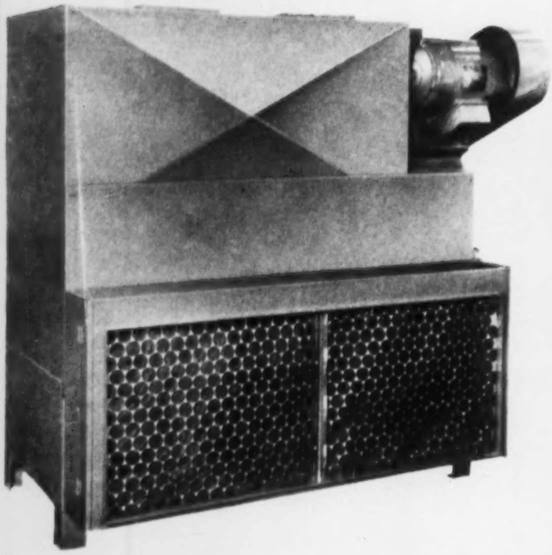
Dept. REG-5, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, W. Toronto

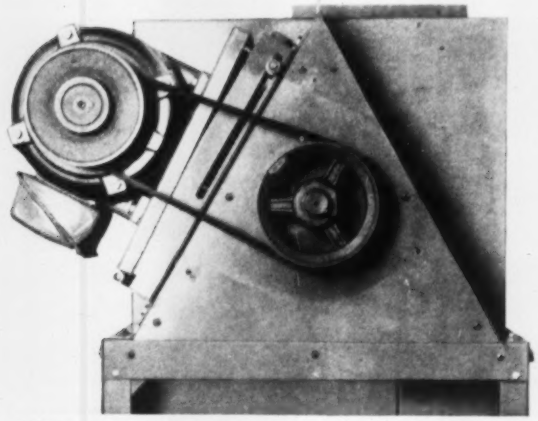
Announcing Worthington's



HORIZONTAL CONSTRUCTION of new Worthington air handling units allow them to be suspended from platform or ceiling (with hanger lugs.) Here is a large sized unit with damper section. Standard unit consists of fan section, fans, V-belt, drive (with variable pitch pulley), bypass and damper section, direct expansion or chilled water coils, and base section.



SMALLER SIZED UNITS are shipped completely assembled for horizontal or vertical arrangement shown above.



ADJUSTABLE MOTOR BASE, exclusive with Worthington, offers a 3½" variation in center distance. Adjusted with a single screw, a locking bolt secures base in proper position. This feature assures positive adjustment, enables you to keep belt tension correct. Belt turns on an adjustable pitch pulley which permits variation of fan speed and air quantity.

complete new line of flexible air conditioning units

Compact units—from 1½ to 106 tons—are easy to install—have many exclusive features

Here's a new line of unusually compact air conditioning units for commercial and industrial use in conjunction with central system-air conditioning.

Designed by Worthington for easy installation, the standard unit consists of a base section, fan section and coil section. A bypass and damper section can be bolted directly to the coil face at the factory if desired, adding no height to the unit.

Units are extremely flexible. The fan section may be mounted with front, top or rear discharge. You can adjust speed for desired capacity and static pressures. Adjustable motor base offers 3½" variation in center distance for positive adjustment of belt tension. The motor mounts on the front, top, back or either end. Accessories are interchangeable between horizontal and vertical units.

Engineered by Worthington for long, trouble-free life, all sections are constructed of rugged fabricated steel, Bonderized and coated with a corrosion resistant enamel. Dynamically balanced, forward curved fans give maximum efficiency, quiet operation. (Fan shaft rides on lubricated-for-life bearings.)

For more facts on this new line of air conditioning equipment, write Worthington Corporation, Air Conditioning and Refrigeration Division, Section A-6.75-HP, Harrison, N. J.

These features add up to flexibility

- **Exclusive** adjustable motor base assures simple, positive adjustment of belt tension.
- **Motor mounts** on front, back or either end of unit.
- **Fan discharge** can be front, top or rear, as you prefer.
- **Accessories interchangeable** between the horizontal and vertical units.

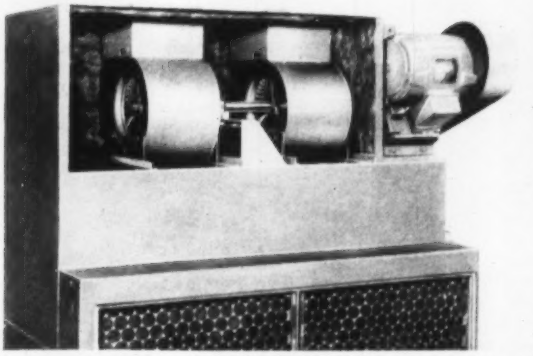
And look at these extras!

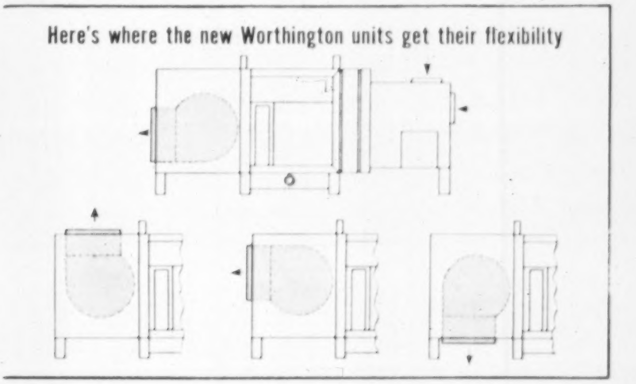
- **Up to 19,000 CFM!** You get more capacity from compact units.
- **Easy installation.** Choose either horizontal or vertical units.
- **Up to 81 different coil** combinations.
- **Lubricated-for-life** fan shaft ball bearings.
- **Accessibility!** Entire fan section can be easily removed. Removable panels and casings simplify inspection, oiling and adjustment.

A 6.75

WORTHINGTON

CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME



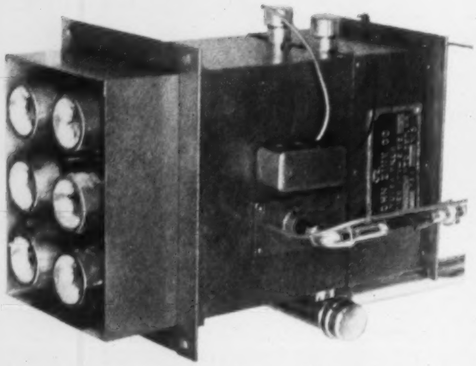


Here's where the new Worthington units get their flexibility

ADJUSTABLE DISCHARGE. Fan section may be mounted with top discharge as shown above. Or discharge may be directed to front or rear of the unit. See diagrams.

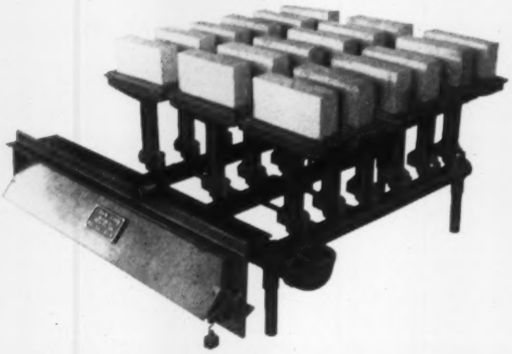
JOHN ZINK

POWER and HEATING BURNERS



SERIES STV GAS BURNER

Ideal for heating boiler installations, to convert from coal or oil to natural gas; and for firing Scotch Marine boilers. From one to fifty heads. Supplied as a complete packaged unit. Quiet, efficient and economical to operate.

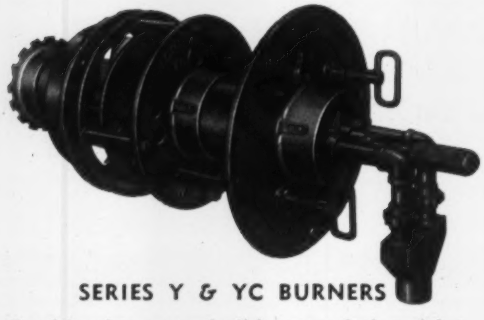


SERIES VR VERTICAL GAS BURNER

The VR Burners are especially designed to operate in boilers having low draft and small combustion space. "Upshot" radiant type with multiple burner heads. Capacities from 4″ to 4 oz.

SERIES "R" BI-AIR BURNER

For all types and sizes Heating Boilers and small Power Boilers. Short flame gas burner with multi-jet burners. Has refractory semi-venturi mixing throats. Capacities to meet your requirements — 4″ to 1#.



SERIES Y & YC BURNERS

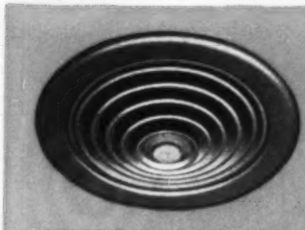
Combination gas and oil burners designed for boilers and furnaces where maximum heat release at low excess air and high heat density place a premium on reliable burner performance. Has extremely high turn-down ratio. Low first cost.

Write for illustrated bulletin on John Zink equipment.

All John Zink Burners are protected by U. S. Letters of Patent

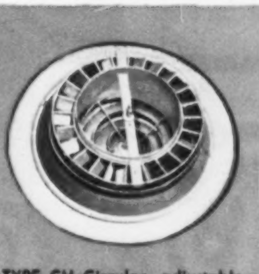
JOHN ZINK COMPANY

4401 South Peoria
Tulsa 5, Oklahoma



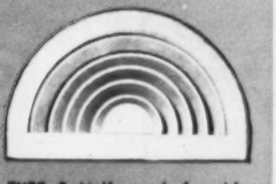
TYPE R Circular, adjustable volume, constant pattern and radius of diffusion.

TYPE V Circular, adjustable volume and pattern, for heating and cooling.



TYPE CH Circular, adjustable supply and return, for heating and cooling.

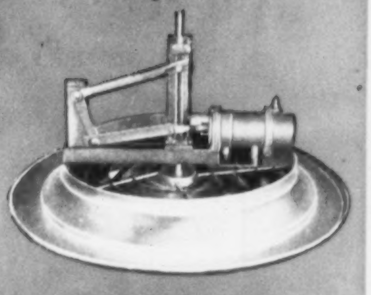
a model for every diffuser need FLEXIFLO



TYPE S Half-round, for side wall or ceiling, for heating or cooling.

- CIRCULAR
- SQUARE
- RECTANGULAR
- ADJUSTABLE
- AUTOMATIC

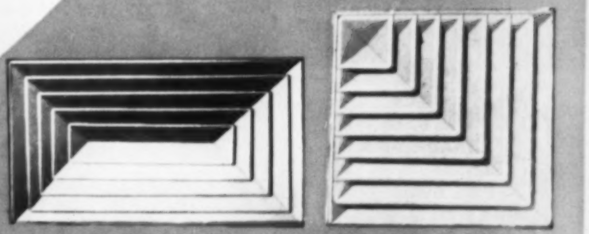
All FLEXIFLO diffusers are styled simply, beautifully . . . finished in baked enamel of any desired color . . . extra features include built-in equalizing deflectors . . . simple, easy installation and removal of diffuser cores with just a "twist of the wrist."



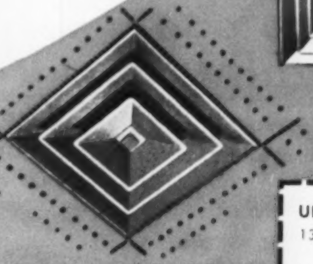
TYPE A Circular, adjustable volume, constant pattern *AUTOMATICALLY CONTROLLED.*

A COMPLETE LINE OF DIFFUSER ACCESSORIES

Let a trained FLEXIFLO sales engineer help you solve your air distribution problem. Representatives in major cities throughout the U.S. and Canada.



TYPE MP Rectangular, for one, two, three or four-way diffusion, 16 styles, hundreds of sizes to accommodate any shaped area.



TYPE H Square, adjustable volume, constant pattern and radius of diffusion.

TYPE MPL Long strips of any length, for one- or two-way diffusion.

UNIVERSAL DIFFUSER CORP.
1360 GARRISON AVE., NEW YORK 59, N.Y.

UNIVERSAL DIFFUSER CORPORATION HP
1360 Garrison Avenue, New York 59

Please send me a complete catalog on

☐ Circular Diffusers ☐ Square & Rectangular Diffusers

NAME________________

COMPANY________________

STREET________________

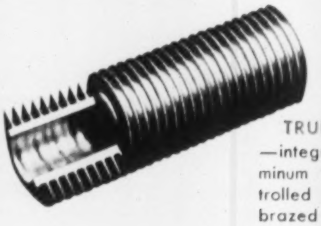
CITY________________ STATE________

your problem . . .
HEAT TRANSFER?

the job-proven answer . . .
WOLVERINE TRUFIN*

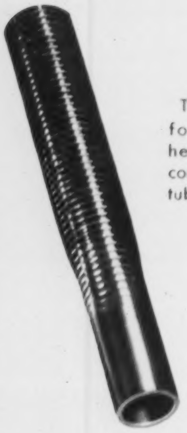
LET'S GET TOGETHER!

TRUFIN TYPE S/T
for all shell and tube heat exchanger and condenser applications.



TRUFIN TYPE H/A
—integral copper or aluminum fin-tube with controlled I.D. to facilitate brazed end connections.

TRUFIN TYPE L/C
—a bi-metal tube economical for air cooled condensers or coolers.



TRUFIN TYPE W/H
for tankless water heaters and U-Bend constructed shell and tube units.

TRUFIN TYPE H/R
—unexcelled for air or gas heat exchangers or condensers.

Wolverine Trufin—the integral finned tube—provides the modern answer to heat transfer problems.

Because it is an extended surface tube—with fins actually extruded from the tube wall—Trufin provides more heat transfer surface than plain tube—gives increased heat duty for each foot of tube.

Wolverine Trufin is available in five distinct types—each engineered to give top performance under different operating conditions. Because of their integral construction, the fins can never shake loose because of vibration, high temperature or high pressures.

Wolverine Trufin is the perfect answer to your heat transfer problems. Specify Trufin—it will help you do a better, more efficient job. For complete information write for your copy of the Trufin Catalog.

WOLVERINE TUBE, 1461 Central Avenue, Detroit 9, Michigan.

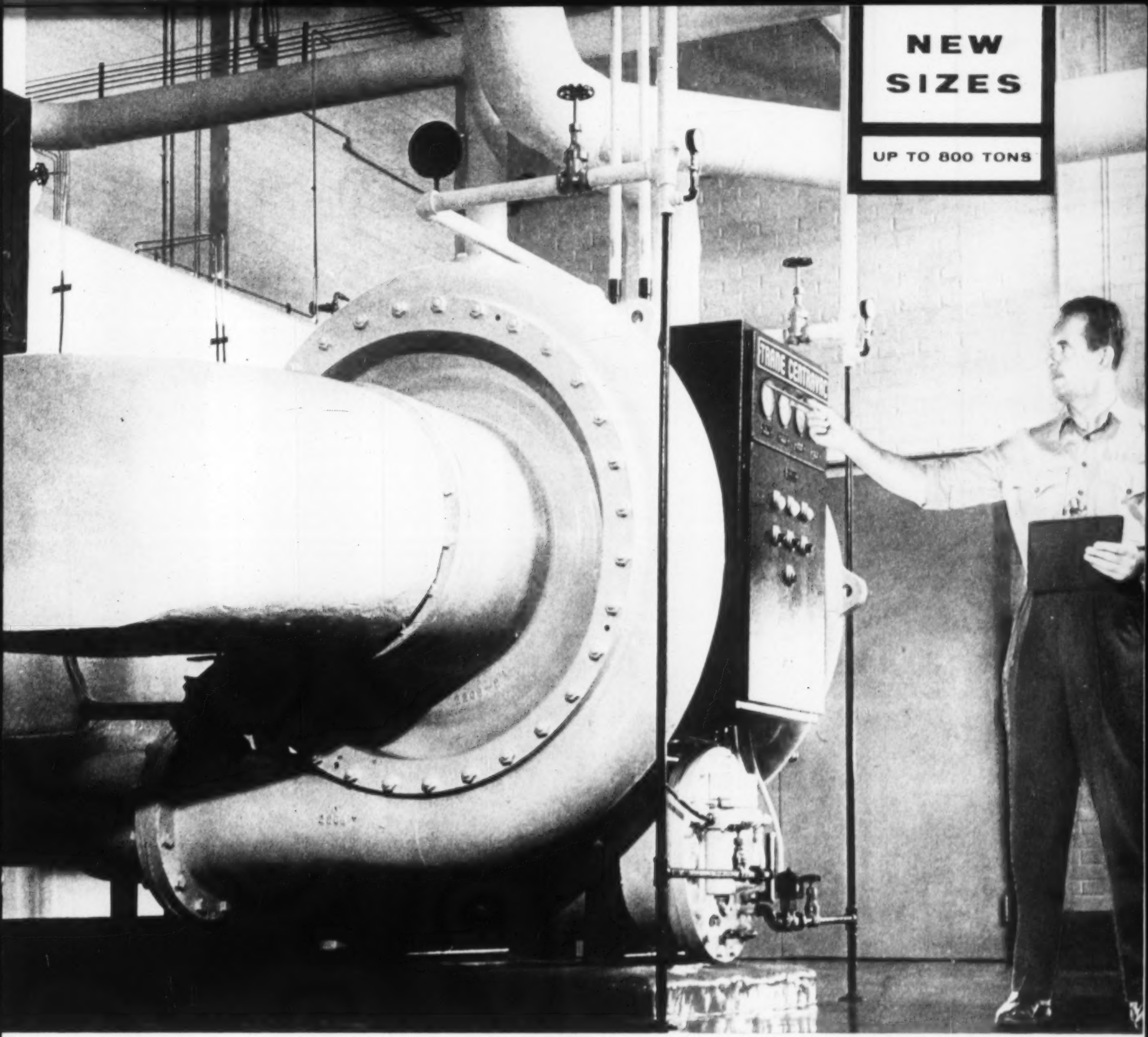
WOLVERINE TUBE
Division of Calumet & Hecla, Inc.
MANUFACTURERS OF QUALITY-CONTROLLED TUBING AND EXTRUDED ALUMINUM SHAPES

*REGISTERED U. S. PATENT OFFICE

Wolverine Trufin available in Canada through the Unifin Tube Company, London, Ontario.

5000

PLANTS IN DETROIT, MICHIGAN, AND DECATUR ALABAMA. SALES OFFICES IN PRINCIPAL CITIES
EXPORT DEPT., 13 E. 40TH ST., NEW YORK 16, N. Y.



Trane CenTraVac, the water chiller you can place anywhere from basement to penthouse—even outdoors!

No matter where your water chilling equipment must be located, here's the way to simplify your problems in design, installation and operation.

You can install the TRANE CenTraVac more easily anywhere from basement to penthouse because it's so compact, quiet and vibration-free. And you can even install it outdoors!

Now, new larger sizes to 800 tons give you *all* advantages found in the TRANE CenTraVac, the industry's first hermetic centrifugal. Just check these convenient CenTraVac features:

Greater freedom of location. No disturbance from noise or vibration.

Flexibility for comfort or process.

Easy installation on any level surface strong enough to support its weight. No field alignment.

Automatic. Automatically adjusts its use of power almost directly to cooling load down to 10% of capacity. No full-time attendant.

Hermetic. No shaft seals, no gear box; only one major moving part.

All are yours in the CenTraVac!

For heating, cooling, ventilating . . .
For any air condition, turn to

TRANE

MANUFACTURING ENGINEERS

COPYRIGHT [illegible] THE TRANE COMPANY, LA CROSSE, WIS.
EASTERN MFG. DIV., SCRANTON, PA.
TRANE COMPANY OF CANADA LTD., TORONTO
[illegible] U.S. AND [illegible] CANADIAN OFFICES

New Trane Air Conditioners take

NEW DESIGN

DRINK
Coca-Cola
TRANE
Coca-Cola
COLD

Trane Accessible Hermetic Compressor

Motor and compressor are completely sealed, yet both are easy to service. Replaceable cylinder liner. Exclusive cadmium-plated valves last up to 800% longer than ordinary steel valves.

Self-Contained up to 27% less space

New beauty with trim new cabinets; new quietness with new "iso-sound" design

Here are "space-misers" for you: the new 3, 5 and 7½ h.p. TRANE Self-Contained Air Conditioners for 1956. They're completely redesigned to pack top efficiency into new, trimmer cabinets—and do their job without making a big noise about it!

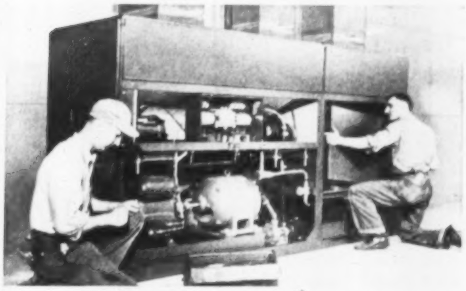
New space-saving—as much as 27% on the 5 and 7½ h.p. models—has been achieved by new twin-fan construction.

New quietness has been attained with "iso-sound" design—fan section and compressor section each *floating independently* on sound and vibration isolators.

New beauty you can see, and your customers will agree!

And full-rated capacities are, as always, guaranteed by rigorous tests in the TRANE Research and Testing Laboratory, "The House of Weather Magic."

With the TRANE Accessible Hermetic Compressor as their heart, these are the complete-in-one-package air conditioners TRANE-engineered, TRANE-built, of components *matched* together to *work* together, to assure complete customer satisfaction. For details, see your TRANE Sales Office or write TRANE, La Crosse, Wis.



"Commercial" Sizes of 10, 15, 20 Tons, Too

Quick and easy to install, these models come with all internal wiring and piping completed. Multi-step capacity control reduces starting and stopping, saves power. Cadmium-coated compressor valves for longer life. Easy to service. Evaporative condensers optional for water savings up to 95%.

For heating, cooling, ventilating . . .
For any air condition, turn to

TRANE

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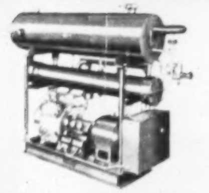
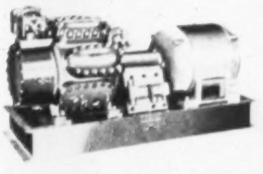
NEW SIZES



TRANE Cold Generators now in 8 new models, including 125 and 150 h.p. sizes. Simple piping and wiring connections make them easy to install.

NEW SIZES

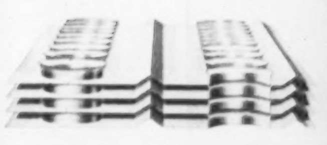
NEW SIZES



Reciprocating Compressors are smooth, direct-drive units. Capacities to 75 tons in single units . . . from 60 to 150 tons in Duplex units.

NEW DESIGN

NEW DESIGN



TRANE Coils have the exclusive Delta-Flo Fin for higher heat efficiency, increased strength, greater ease of cleaning. Mechanically bonded.

New UniTrane models for '56
Air Conditioner Line

NEW MODELS
Horizontal Cabinet Models
Horizontal Concealed Models
Vertical Concealed Models

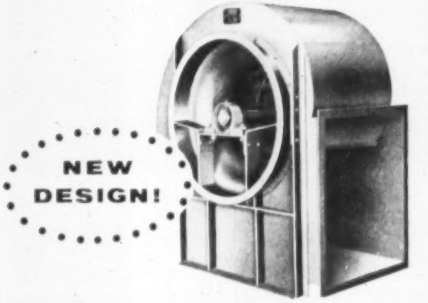
provide the most versatile in Trane history!

Now! Induction UniTrane units make the Trane line wider than ever!

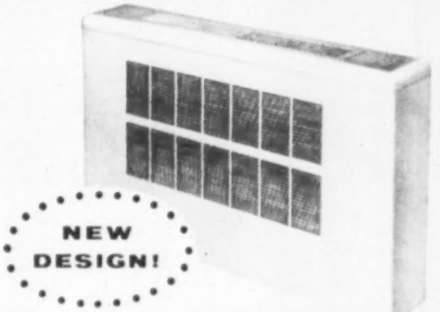
The famous UniTrane individual room air conditioners for 1956 are slimmer, with new, trim, space-saving design. And they provide individual room control with maximum flexibility and economy of operation. Simple piping and wiring connections—yet they heat or cool, ventilate, dehumidify and filter *all* the air!

Best of all, there's a UniTrane model to fill the most exacting requirements for any multi-story, multi-room application—for new or existing buildings. There are attractive floor models that blend with modern building design; ceiling models for furred-in installations; concealed types for that "built-in" look. And now, for 1956, the line is made more versatile with the addition of the new Induction UniTrane unit with optional filters for installations where it is desired to filter *all* the air. Housed in an attractive cabinet so sturdy it supports a man's weight, this new unit is trim, compact and efficient.

So now, with these Induction units, the regular Fan-Coil UniTrane units, Climate Changers and other TRANE equipment, TRANE brings you *matched* equipment to do any air conditioning job—from small shop to giant skyscraper! In flexibility for design and installation, or for future remodeling, here is the utmost in air conditioning equipment . . . units designed and built together to work together!



Class III Fans now in a wider range of *standard* sizes bring you new freedom of design. Designed especially for high-pressure air conditioning systems.

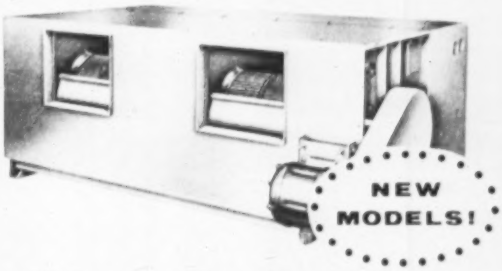


Induction UniTrane air conditioners may be ordered to filter *all* the air—not just the primary air. Individually controlled for personal climate preference or changing needs.

For heating, cooling, ventilating . . .
For any air condition, turn to

TRANE

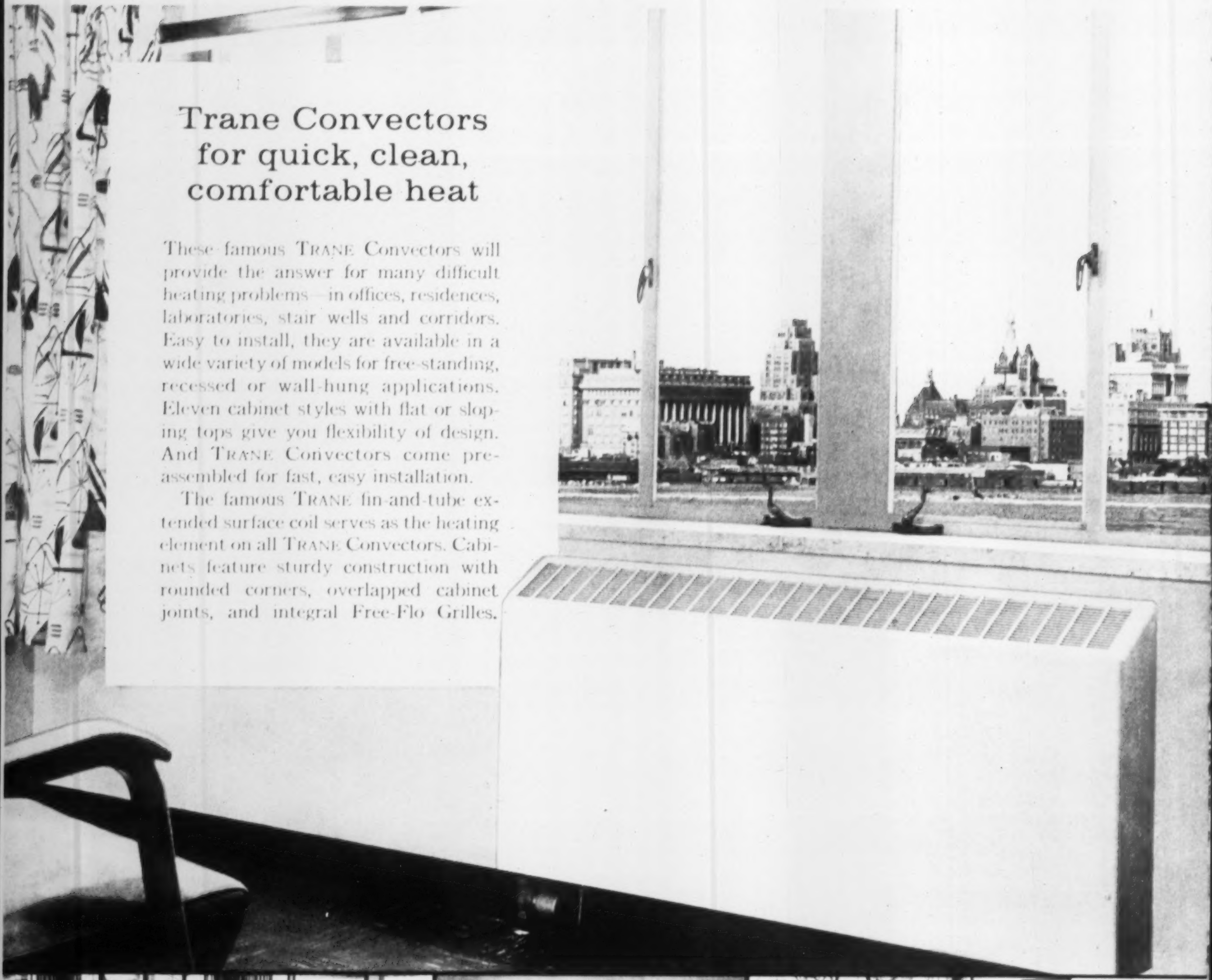
MANUFACTURING ENGINEERS



TRANE Climate Changers meet a wide variety of air conditioning requirements. Multi-zone models provide different climates for up to 6 zones at the same time. Capacities: Regular models to 29,000 cfm; Multi-zone models to 23,400 cfm.

**For skyscrapers, schools
or corner stores,
houses, apartments
or industrial plants . . .**

One source . . .
your heating

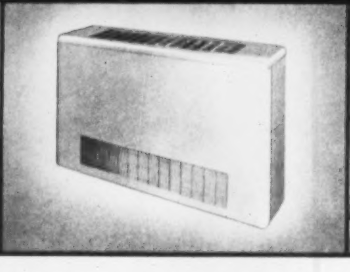


Trane Convectors for quick, clean, comfortable heat

These famous TRANE Convectors will provide the answer for many difficult heating problems—in offices, residences, laboratories, stair wells and corridors. Easy to install, they are available in a wide variety of models for free-standing, recessed or wall-hung applications. Eleven cabinet styles with flat or sloping tops give you flexibility of design. And TRANE Convectors come preassembled for fast, easy installation.

The famous TRANE fin-and-tube extended surface coil serves as the heating element on all TRANE Convectors. Cabinets feature sturdy construction with rounded corners, overlapped cabinet joints, and integral Free-Flo Grilles.

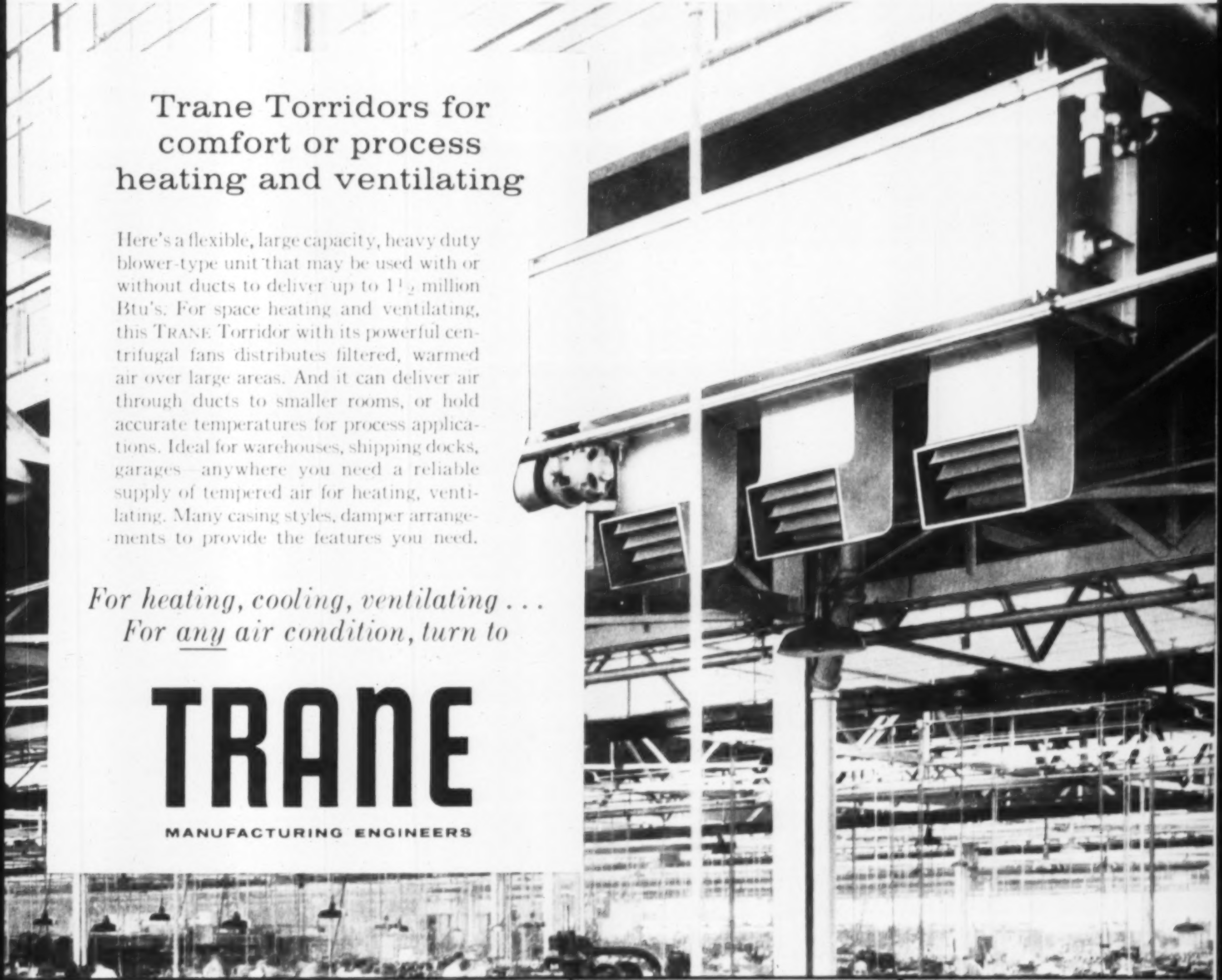
TRANE Wall-Fin brings draft-free heating to long wall and window areas. Can be used singly or in tiers as a low cost means of space heating or supplemental heating at points of high heat loss. Sloping top cabinets or grilles.



TRANE Force-Flo Heaters provide a blanket of heat for doors and entryways in restaurants, shops, showrooms and public places. Compact units, ideal for hard to heat places.

TRANE Baseboard Convectors heat where the cold begins—along outer walls, under windows. 50% faster installation—because cabinet and coil are preassembled. Efficient heat transfer assured by TRANE Extended Surface Coil, adapted to baseboard use.

One responsibility for all and ventilating needs!



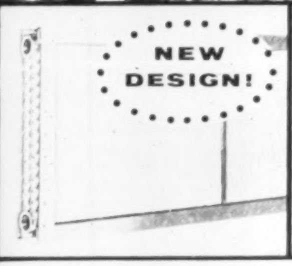
Trane Torridors for comfort or process heating and ventilating

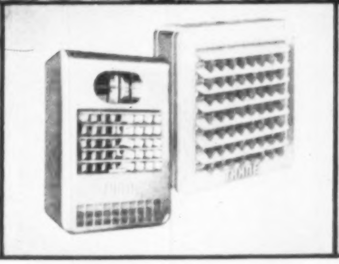
Here's a flexible, large capacity, heavy duty blower-type unit that may be used with or without ducts to deliver up to $1\frac{1}{2}$ million Btu's. For space heating and ventilating, this TRANE Torridor with its powerful centrifugal fans distributes filtered, warmed air over large areas. And it can deliver air through ducts to smaller rooms, or hold accurate temperatures for process applications. Ideal for warehouses, shipping docks, garages—anywhere you need a reliable supply of tempered air for heating, ventilating. Many casing styles, damper arrangements to provide the features you need.

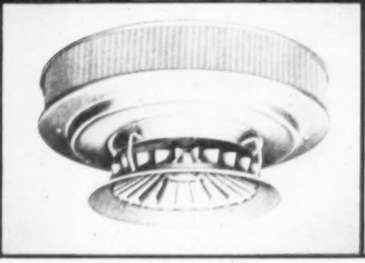
For heating, cooling, ventilating . . .
For any air condition, turn to

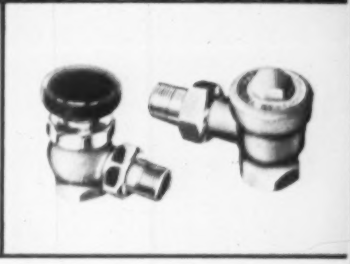
TRANE

MANUFACTURING ENGINEERS









TRANE Heating Coils provide instant heat response. Aluminum-copper construction with exclusive Delta-Flo Fin and mechanical bond.

Horizontal and Gas-Fired Unit Heaters put the heat where you want it. Only TRANE Heaters have the exclusive, patented Louver Fin Diffusers that direct air stream in any number of patterns.

Projection Unit Heaters are vertical discharge units with patented TRANE Louver Cone Diffusers. Can direct heat in different directions, different proportions at the same time!

TRANE Steam Specialties save fuel, stop waste, protect equipment. Complete line of valves, traps, strainers, vents for heating or process applications.

Trane Unit Ventilator with Kinetic Barrier Action stops drafts all day long!

This smoke test shows how the TRANE Unit Ventilator is helping solve the ventilating problem in modern schools . . . helping to maintain even temperatures and eliminate drafts—in every corner of the room.

The TRANE Unit Ventilator, with *Kinetic Barrier* action, forces air upward under *constant* pressure. Stops chilling downdrafts *all day long.* Rising not just at one point, but blanketing the entire wall, this tempered air blends with room air to keep the air in every part of the classroom fresh and comfortable.

Whisper-quiet in operation, the TRANE Unit Ventilators have decorator styling that adds to the beauty of any room. Baked-on finish is extremely resistant to scuffs, bumps and kicks . . . stays *new-looking* longer!

For heating, cooling, ventilating . . .
For any air condition, turn to

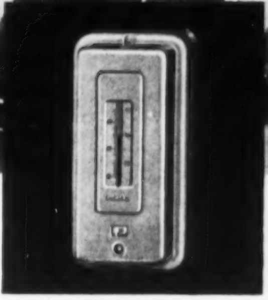
TRANE

MANUFACTURING ENGINEERS

COPYRIGHT 1956 — THE TRANE COMPANY, LA CROSSE, WIS. • EASTERN MFG. DIV., SCRANTON, PA. • TRANE COMPANY OF CANADA, LTD., TORONTO • 90 U.S. AND 17 CANADIAN OFFICES

Cincinnati Public Library

Architects: WOODIE GARBER & ASSOCIATES
Associated Architects: SAMUEL HANNAFORD & SONS
Mechanical Engineers: WM. E. BODENSTEIN & W. W. SHUSTER
Htg. and Air Cond. Contractor: PECK-HANNAFORD & BRIGGS CO.



Ideal Comfort in this

Department Store of Knowledge

Is Assured by **POWERS** *Year 'round Air Conditioning Control System*

Cincinnati now has one of the nation's most colorful and attractive contemporary libraries. It is fully air conditioned.

Some of the Library's many features are: a children's room with child's size furniture, also a story hour room; film and recording center; a rare book room and director's room with stainless steel operable louvers on the exterior; rooftop terrace with planting boxes and reflecting pools; ground floor has a garden, pool and parking lot.

As modern as the building itself, is the Powers individual space control system which assures these important benefits: Maximum thermal comfort and fuel savings; low operating and maintenance cost; 25 to 40 years of reliable control with a minimum of repairs often reported by users.

Consult Powers on your temperature and humidity control problems. Experience gained here and in thousands of other significant buildings may be helpful to you.

THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS | *Offices in chief cities in U. S. A., Canada and Mexico*

(c61)

65 Years of Automatic Temperature and Humidity Control

REALLY CONTROL AIR

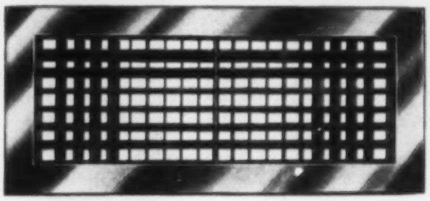
Specify Titus grilles and *know* that you can create the air patterns necessary to meet individual requirements of room and occupant... *ANY SEASON OF THE YEAR.*

Know that you can *pinpoint* the air stream to a specific area... or *diffuse* it... or *deflect* it... or *turn* it... or *reverse* it... or *blanket* a certain part of a room. ACCOMPLISH THIS WITH QUICK, SIMPLE, EASY, INDIVIDUAL ADJUSTMENTS OF THE LOUVERS ...without removing grilles from the walls.

Room comfort is directly proportioned to how forced air is handled in the occupied zone (the region within a room between floor and the 72" level) . . . *and this is the only area where the entire unit's cooling and heating performance is judged.*

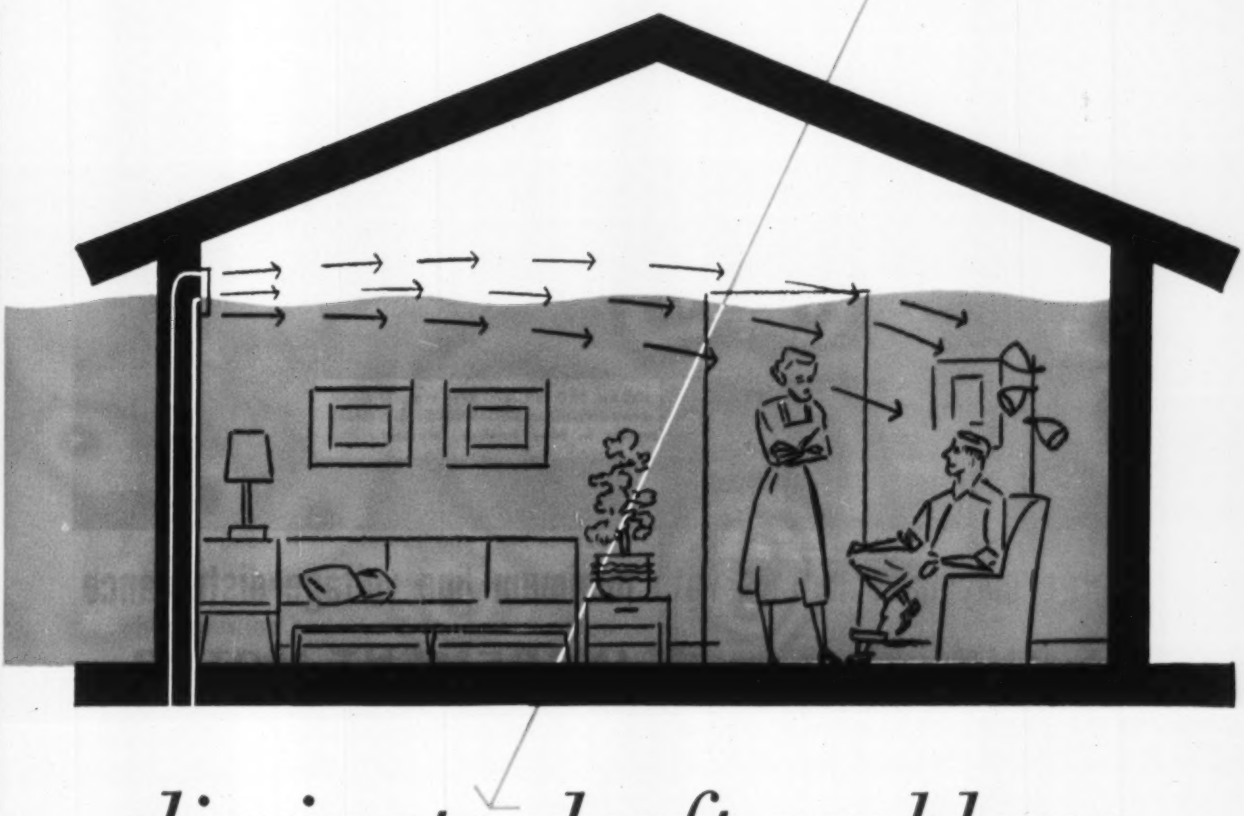
• • • • • • • • • • • • • REMEMBER:

DON'T TAKE ANY SHORT CUTS HERE... THE OUTLET CAN MAKE OR BREAK THE PERFORMANCE OF YOUR ENTIRE HEATING OR COOLING SYSTEM... there are basically only 3 places you can place an outlet... in the wall, ceiling, or baseboard—but there are literally hundreds of different air patterns that may be required from that outlet. That's why Titus grilles with MORE AIR CONTROL PER SQUARE INCH assure better performance from any forced air heating or cooling system.



TITUS GRILLES

. . . in the OCCUPIED ZONE



eliminate draft problems

FOR MORE Complete information on *"HOW TO CONTROL AIR IN THE OCCUPIED ZONE"* write for FREE CATALOGS.

TITUS MFG. CORP.
Waterloo, Iowa

Gentlemen: Please rush me complete free information on:

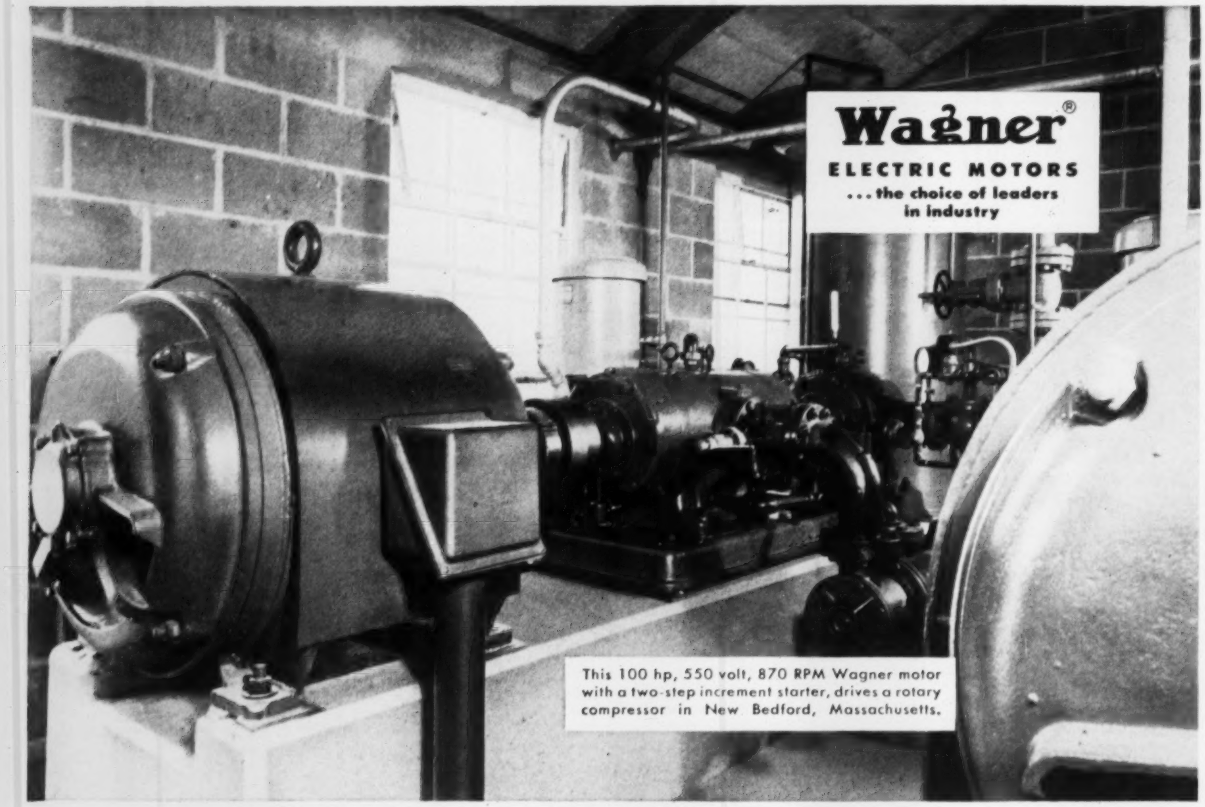
☐ Supply Grilles & Registers
☐ Volume Controllers
☐ Frames and Accessories
☐ Return Air Grilles
☐ Gymnasium Grilles
☐ Perimeter Diffusers

Name____________________

Company____________________

Address____________________

City__________ State__________



This 100 hp, 550 volt, 870 RPM Wagner motor with a two-step increment starter, drives a rotary compressor in New Bedford, Massachusetts.

Start large polyphase motors with minimum line voltage disturbance

USE THE Wagner INCREMENT MOTOR AND STARTER COMBINATION

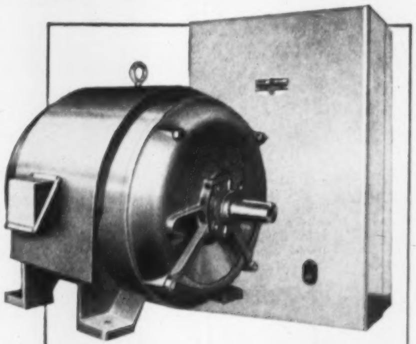
Here's a modern, economical, highly efficient way to start large polyphase motors — the Wagner Increment Motor and Starter "Package."

By reducing current drawn from the line on each point of the starter, the combination limits the inrush of motor current to values that are acceptable for the distribution systems of most power companies.

Voltage disturbances on the line are reduced because current taken from the line is not broken during the starting period—as it is when autotransformers or compensator type starters are used.

Wagner two-step increment motor and starter combinations are suitable for most applications. For installations where unusually low inrush of starting current is desired, Wagner can furnish three-step and four-step increment starters.

Your nearby Wagner engineer will help you select the increment motor and starter combination that meets *your* requirement. Call the nearest of our 32 branch offices, or write us.



Type RP polyphase motor in ratings to 400 hp with increment type starter

Wagner Electric Corporation
EST. 1891

Wagner Electric Corporation
6370 Plymouth Ave., St. Louis 14, Mo., U. S. A.

M55-16

ELECTRIC MOTORS · TRANSFORMERS · INDUSTRIAL BRAKES · AUTOMOTIVE BRAKE SYSTEMS-AIR AND HYDRAULIC

ANOTHER "BEST BUY" BY PEERLESS

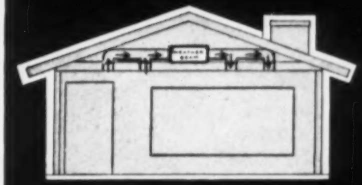
Weather Beam Air Conditioner

For Connection to Remote Direct Expansion or Chilled Water Cooling System or to Remote Hot Water Heating System

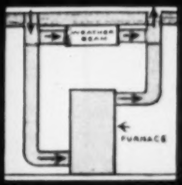
For a satisfactory air conditioning installation, choose the Peerless Weather Beam. Its high efficiency, beauty, ease of installation, accessibility to working parts and freedom from service assure maximum profits on any job. The Weather Beam is engineered and built to meet the needs of any contractor or service engineer who wants the best at a price he can afford to pay. ON TIME DELIVERY IS ASSURED

The Duct Type Weather Beam is recommended for residential, commercial and small industrial buildings. The Ductless Type is adaptable for offices, stores, motel lobbies and restaurants.

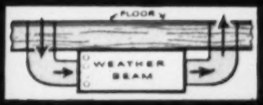
DUCT TYPE



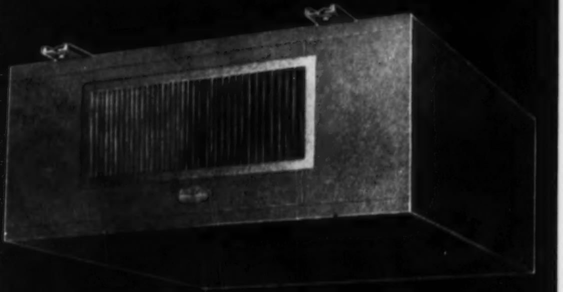
Attic Installation In Small Home



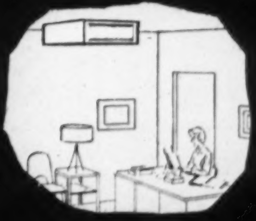
Suggested Hook-up In Warm Air Heating System



(Left) Installation in Crawl Space



DUCTLESS TYPE



Ceiling mounted. No waste of floor space. Internal bank of louvers controls air flow vertically and external louver bank controls air flow horizontally. No cold or hot spots in room.

PEERLESS
PEERLESS AMERICA CHICAGO

Your request for new bulletin and confidential trade price list should be written on company letterhead.

2 AND 3 TON CAPACITIES

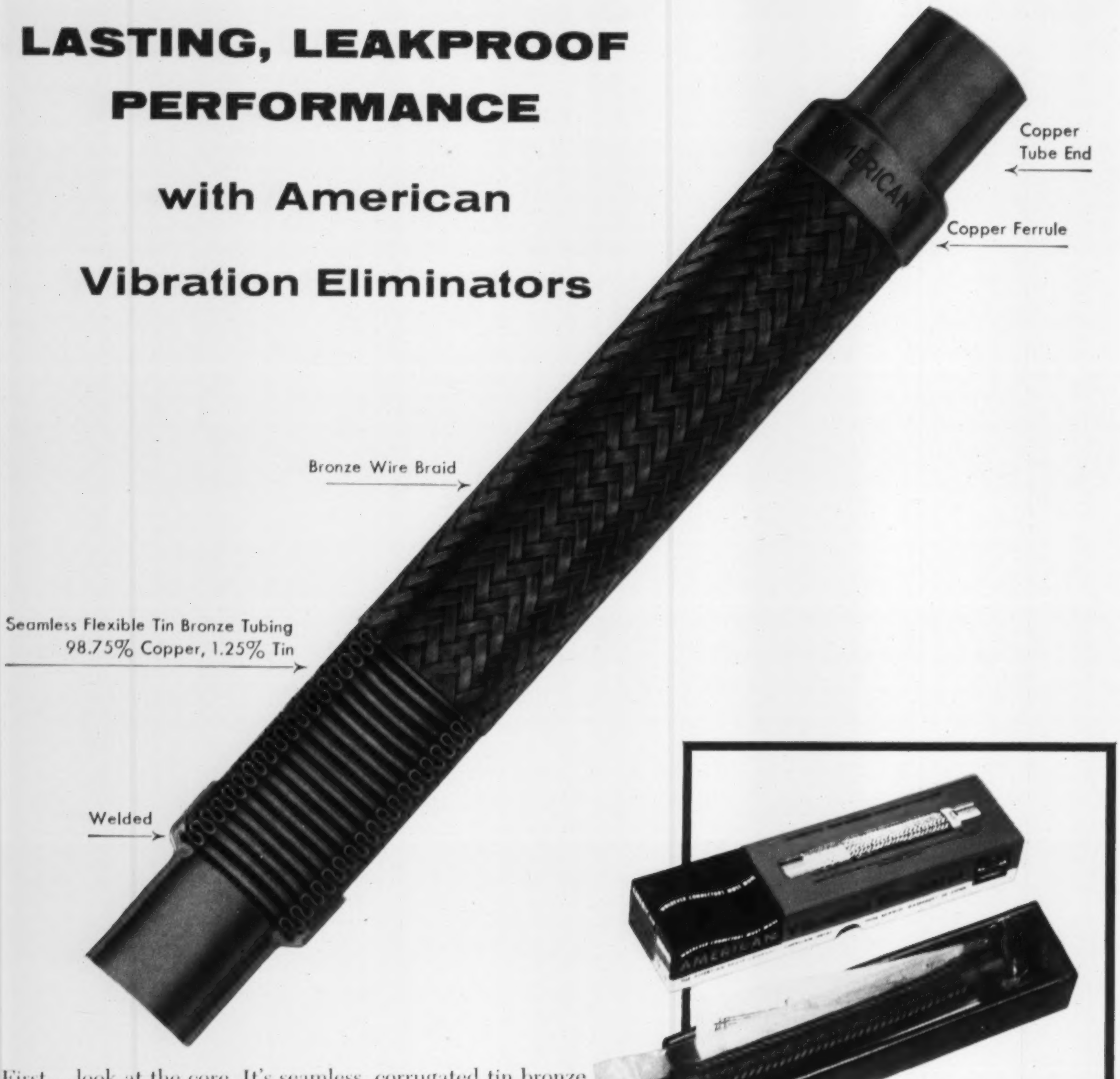
PEERLESS OF AMERICA, INC.

MANUFACTURERS OF REFRIGERATION AND AIR CONDITIONING COILS SINCE 1912
DEPT. H, 5830 NORTH PULASKI ROAD, CHICAGO 30, ILLINOIS, U.S.A.

Why you can be sure of

LASTING, LEAKPROOF PERFORMANCE

with American Vibration Eliminators


Copper Tube End
Copper Ferrule
AMERICAN
Bronze Wire Braid
Seamless Flexible Tin Bronze Tubing 98.75% Copper, 1.25% Tin
Welded

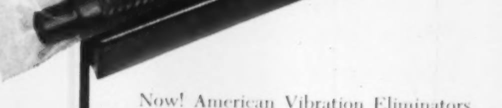
First... look at the core. It's seamless, corrugated tin bronze tubing, quality-controlled through every manufacturing stage. This copper-tin alloy is specially engineered to stand up under vibration while carrying gases and liquids under pressure. Because it's *seamless*, there are no joints or laps where leaks can start.

Next... for extra strength and durability, it's covered with bronze wire braid securely brazed in place. Sizes through 2″ have a single wire braid covering, larger sizes a double braid covering for added strength.

Then... before it's shipped, the final assembly is pressure-tested, oven-dried, and sealed in a plastic envelope to keep out dirt and moisture.

American Vibration Eliminators are sold by leading distributors everywhere. For descriptive folder of standard sizes with installation suggestions, write to *The American Brass Company, American Metal Hose Division, Waterbury 20, Connecticut.* In Canada: *The Canadian Fairbanks-Morse Company, Ltd.*

55190



Now! American Vibration Eliminators are listed by Underwriters Laboratories through sizes 3⅝″ O.D. Each VE is sealed in an air-tight polyethylene envelope assuring factory-clean condition.

for American Vibration Eliminators

see your

ANACONDA®

distributor

Classic
DETROIT CONTROLS
40 50 60 70 80 90 100

Insist on the New Classic Thermostat...

Get Accurate Heating Control
Attractive, Modern Styling
Easy, Inexpensive Installation

***Install* DETROIT CONTROLS'**
New Classic Thermostat
for Customer Satisfaction!

The Classic will add style and saleability to the heating systems you manufacture, sell or install.

Its smart, modern design will complement the decoration of any home, new or old. The single, large numbered dial is slanted for perfect vision—can be read at a glance! The temperature selector is directly under the indicator needle—eliminates fumbling with old-fashioned turning or twisting devices.

Installation is very simple. No precision levelling is necessary. The Classic requires only two wires—easily replaces any two or three wire thermostat of earlier design.

Close control of any type heating, within a *fraction of a degree,* is assured by Detroit Controls' Timed Cycling function.

National advertising in Better Homes & Gardens, Small Homes Guide, Home Modernizing and other magazines will bring broad consumer acceptance to the Thermostyled Classic.

Take Advantage of this opportunity...

SELL THE Classic

DETROIT CONTROLS
CORPORATION

5900 TRUMBULL AVE. • DETROIT 8, MICHIGAN
Division of AMERICAN RADIATOR & STANDARD SANITARY Corporation

Representatives in Principal Cities · Canadian Representatives:
RAILWAY AND ENGINEERING SPECIALTIES, LTD.,
Montreal, Toronto, Winnipeg

AUTOMATIC CONTROLS for DOMESTIC HEATING • AIR CONDITIONING • REFRIGERATION • AVIATION • TRANSPORTATION • HOME APPLIANCES • INDUSTRIAL USES

Aquatowers®

WITH

MarClad

THERMO-SETTING PLASTIC

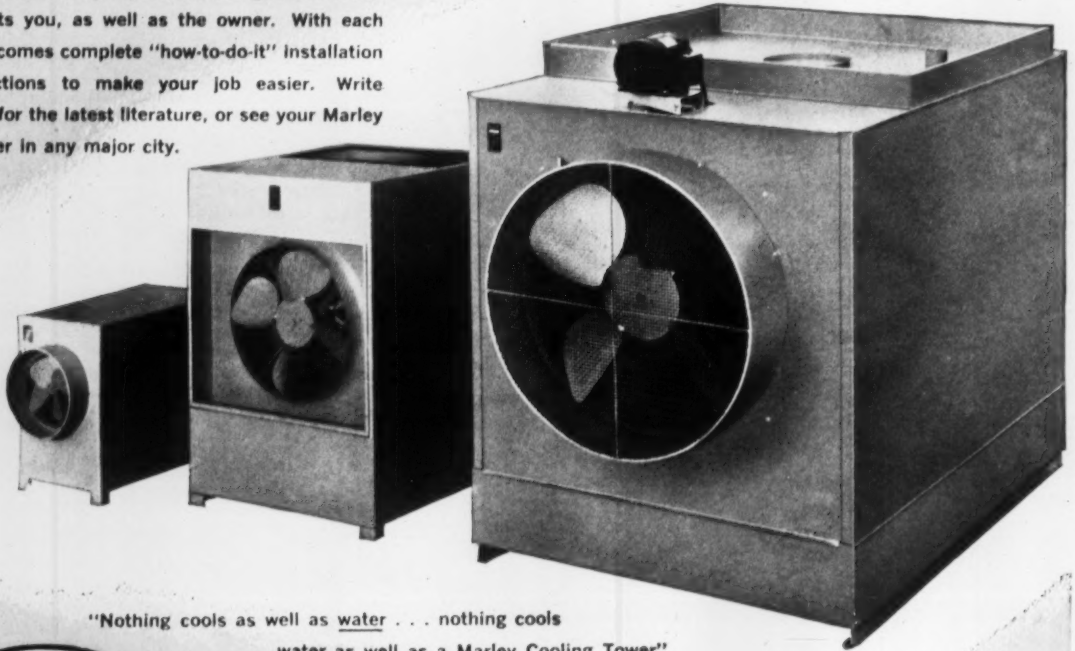
FINISH

...for a Long Life and a happy one!

It's a happy day for you and your customer when you install a '56 Aquatower with new MarClad finish because it's packed with more eye appeal and designed to give longer service than any other packaged cooling tower!

MarClad is a two-coat, high-temperature baked plastic finish that resists rust and corrosion . . . defies the attack of acids, alkalis and water. MarClad protects Aquatowers from damage in storage, on their way to the job and during installation . . . and insures that they will last to a ripe old age. What's more, MarClad's soft gray color lends that compatible look that is so pleasing to owners.

From start to finish, '56 Aquatowers are a better buy than ever before. Back of each tower stands the Marley reputation and guarantee that protects you, as well as the owner. With each tower comes complete "how-to-do-it" installation instructions to make your job easier. Write today for the latest literature, or see your Marley supplier in any major city.



"Nothing cools as well as water . . . nothing cools water as well as a Marley Cooling Tower"

MARLEY

The Marley Company

Kansas City, Missouri

The Welding of Two Reputable Names

(Long Famous for Quality and Service)

into

A NEW SYMBOL

of modern efficiency in
heating and air conditioning equipment
which means:

a complete line under one brand name

ready acceptance and faster, profitable turnover

easy installation with dependable results

and to the consumer:
more healthful, comfortable living

HEATING AND AIR CONDITIONING PRODUCTS
National-U.S. Radiator
CORPORATION
FOR MORE HEALTHFUL - COMFORTABLE LIVING

National-U.S. Radiator

CORPORATION

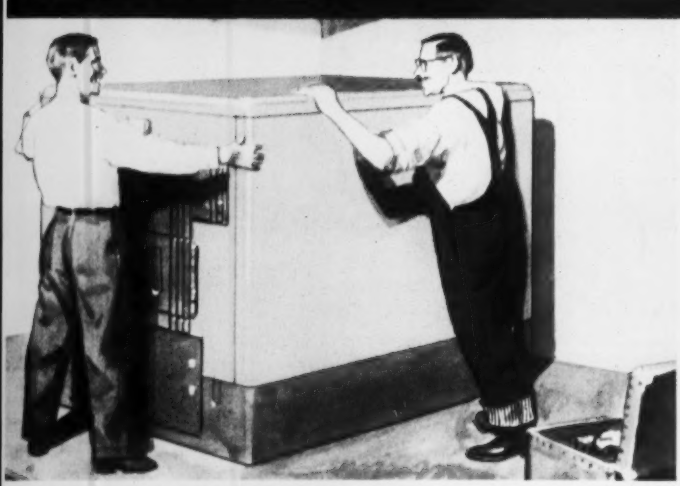
This new name originated by the joining together of two famous long established companies in the heating field, recognized for high standards of quality and service, marks a new milestone of progress in the heating and air conditioning industry.

- It brings together two top-flight engineering organizations for development and research. It unites the manufacturing abilities and know-how of two leading companies, each with over a half century of production experience in heating products.
- It offers the newest and most complete line of heating and air conditioning equipment in the world

What this means to ***YOU***

to: Wholesalers

- A completely integrated full line of modern hot water and steam heating products and air conditioning equipment.
- All equipment and accessories may be purchased and selected from *one source*.
- Minimum investment required because stocking is simplified.
- A line that is easier to sell . with faster turnover and better profit due to dealer acceptance and demand.



to: Dealers

- Hot water and steam heating and air conditioning products designed for fast and easy installation with lower labor costs.
- Better "all-from-one source" service from National-U.S. Wholesalers saves time and money.
- Prestige of two leading names in heating and air conditioning brings ready acceptance of builders and home owners the result of expanding nationwide sales promotion and advertising programs.

HEATING AND AIR CONDITIONING PRODUCTS

National-U.S. Radiator

CORPORATION

FOR MORE HEALTHFUL - COMFORTABLE LIVING

HEATING AND AIR CONDITIONING

HEATING AND AIR CONDITIONING DIVISION

produced under one brand name for any requirement large or small.

- It brings expanded nationwide sales service through 11 strategically located manufacturing plants and 24 company owned and operated offices, adequately staffed by competent and experienced sales engineers.

to: Architects, Builders

- Availability of wide range of all types of hot water and steam heating products and air conditioning equipment to meet clients specifications for performance, compactness, appearance, economy of operation or unusual requirements.
- The facilities of the combined research and engineering organization assure you of up-to-the-minute developments in heating and air conditioning.
- The product reputation of the two combined companies for quality, dependability, efficient performance and long service builds client satisfaction.

to: Owners

- National-U.S. Heating products and air conditioning equipment incorporate the latest engineering achievements in design and construction for operating economy, performance efficiency and modernly styled appearance.
- These benefits mean long trouble-free service . . . for more healthful, comfortable living.

See Complete Line on next page ▶

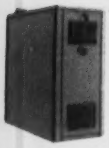
PRODUCTS *for year round, more healthful, comfortable living*

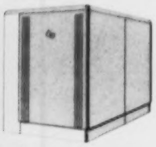
HEATING AND AIR CONDITIONING PRODUCTS
National-U.S. Radiator
CORPORATION
FOR MORE HEALTHFUL - COMFORTABLE LIVING

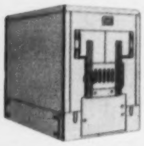
The Complete Line
# of Hot Water and Steam Heating Products and Air Conditioning Equipment

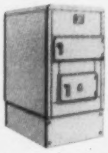
All Types — All Sizes — for all Structures
Residential — Institutional — Commercial — Industrial

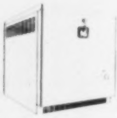
BOILERS

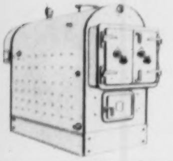

Cast Iron Boilers for automatic firing

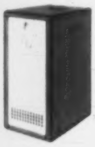

Oil Boilers and Oil Heating Units

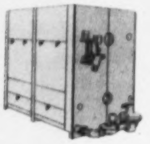

All Fuels Boilers Convertible Type

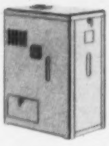

Residential Steel Boilers and Units


National-U.S. Packet for gas or oil firing

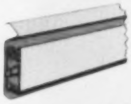

Commercial Steel Boilers for Automatic and Hand Firing

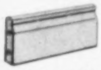

Gas Boilers Packaged

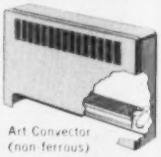

Gas Boilers Commercial

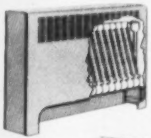

Gas Boilers Residential

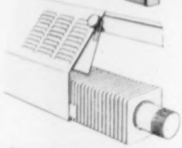
HEAT DISTRIBUTORS

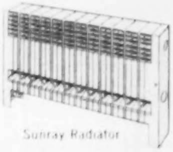

Art Baseboard (non-ferrous)

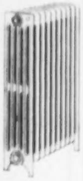

Radiant Baseboard (cast iron)


Art Convector (non-ferrous)

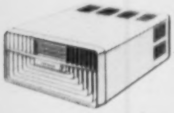

Aero Convector (cast iron)

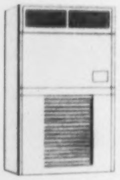

Fintube radiation

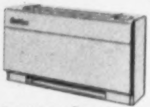

Sunray Radiator

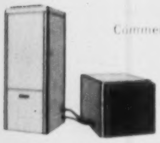

Thin Tube Radiator

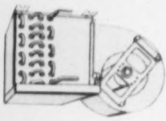
CAPITOLAIRE AIR CONDITIONERS

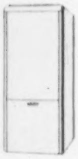

Room Air Conditioner


Commercial Packaged Air Conditioner

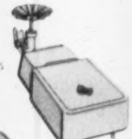

Capitolaire Console Summer Winter Unit

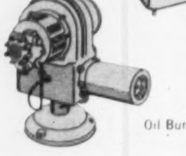

Air Cooled Residential Air Conditioner


Capitolaire Horizontal Fan Coil Unit

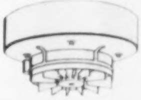

Water Cooled Residential Air Conditioner

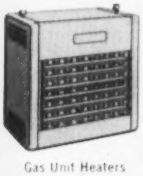
CONVERSION BURNERS

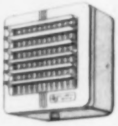

Gas Burners


Oil Burners

UNIT HEATERS


Vertical (Down Flow) Delivery


Gas Unit Heaters


Horizontal Delivery

22.33.44 Series

This newly compiled National-U.S. literature contains full information on each individual product in the complete line of Heating and Air Conditioning products

National-U.S. Radiator
CORPORATION
HEATING AND AIR CONDITIONING DIVISION
Johnstown, Pennsylvania

Wholesalers Get in touch with your nearest National-U.S. Branch Office

Dealers See your nearest National-U.S. Wholesalers

Architects
Builders
Owners contact your nearest National-U.S. Dealer

Form No. 793 50M ALG156 Printed in U.S.

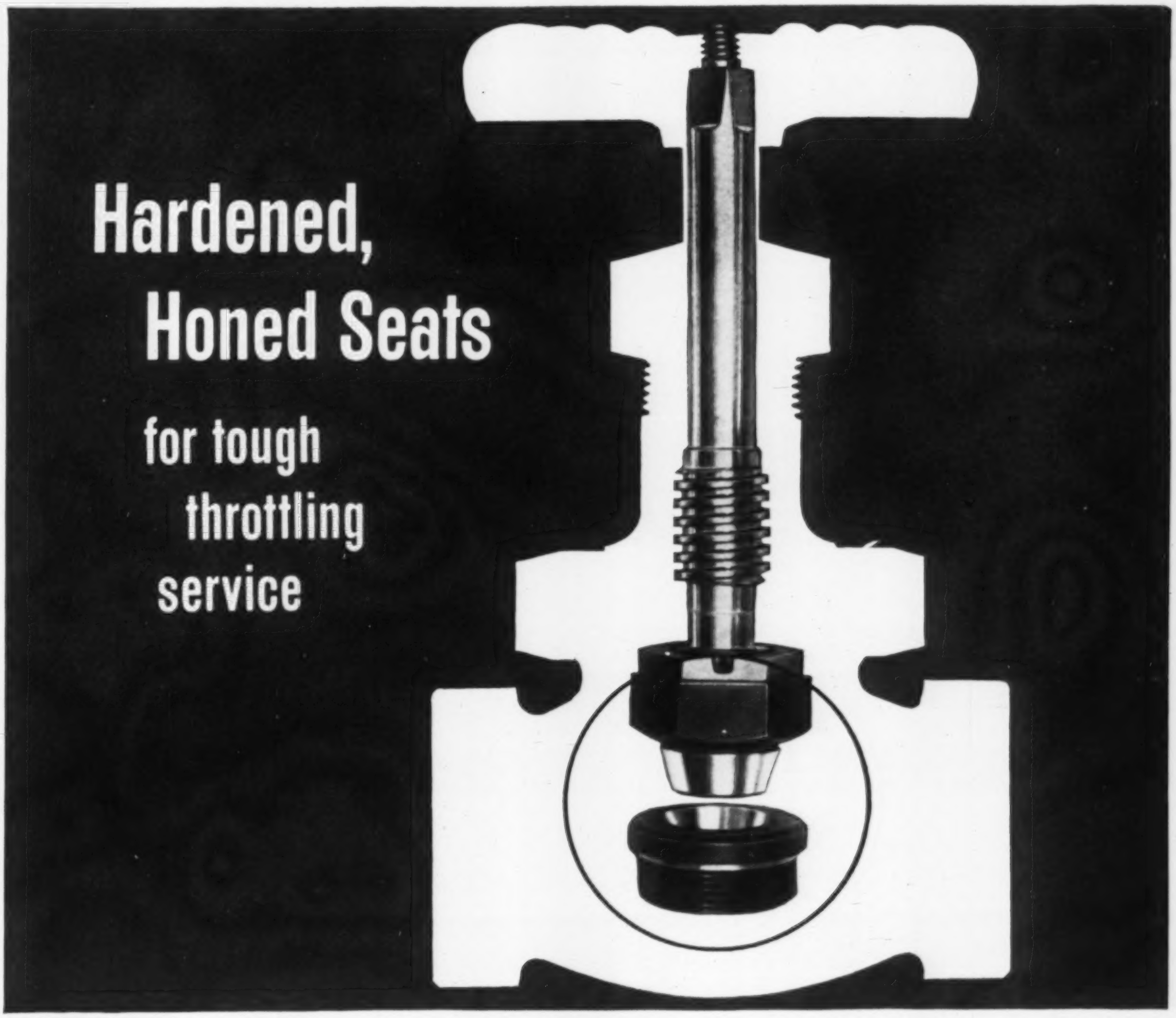


Fig. No. 558, bronze globe valve, 200 lbs. WSP, @ 550°F., 400 lbs. WOG, non-shock

A plug-disc and seat so hard they can crush scale between them and still close tight. A stem that absolutely will not gall or seize. The combination is in a rugged bronze valve designed for tough throttling service . . . the OIC 558!

Both plug-disc and seat are stainless steel, heat-treated to more than 500 Brinell hardness. Their seating surfaces are ground and *honed* to an accurate, smooth, bearing finish. The stem is OIC *alloy-40,* a sturdy bronze which won't gall or seize.

Remember, in throttling service a valve's stem, plug-disc and seat must withstand the most abusive wear. Rely on the toughness designed into this OIC line to give you extra-long service. Specify the modern 558 where you need bronze globe valves for throttling.

Write for Form No. 1001 which describes this valve along with the entire OIC 500 line, including composition disc and spherical disc globes, angles and check valves.

Call your OIC Distributor.

OIC
FOUNDED 1883

THE OHIO INJECTOR COMPANY • WADSWORTH, OHIO

P-507

VALVES | **FORGED & CAST STEEL, BRONZE & IRON, LUBRICATED PLUG VALVES**

Carrier again makes news

A new centrifugal for air conditioning

From Carrier—the people who built the *first* centrifugal refrigerating machine—now comes a *new* centrifugal designed especially for big building air conditioning, and for chilling water for industries.

It's a hermetic—**WITH CARRENE-COOLED MOTOR** . . . exclusive with Carrier! Cool, dry refrigerant gas from the refrigerating circuit keeps motor temperatures at a uniform level under all load conditions.

It's a hermetic—**WITH ELECTRONIC CONTROLS** . . . exclusive with Carrier! You push a single button and electronic controls take over the entire operation, including starting, stopping, part load, and protection of the machine under all conditions.

It's a hermetic—**WITH CENTRAL CONTROL CONSOLE** . . . exclusive with Carrier! All control functions are co-ordinated in a central console. You can locate this nerve center right by the machine, or in the next room.

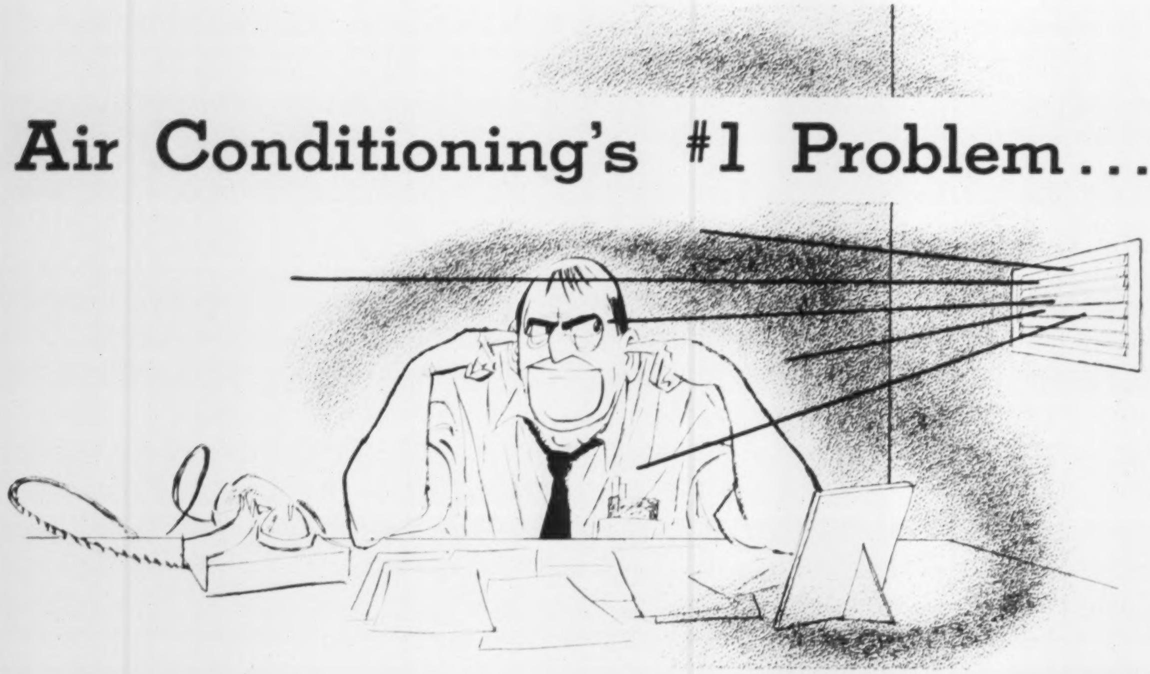
It's a hermetic—**WITH HYDRAULIC CAPACITY VANES** . . . exclusive with Carrier! Capacity regulating prewhirl vanes are *positively* positioned by hydraulic power under the automatic control of the electronic system.

Get the full story—*now*. Call the nearest Carrier office for your copy of the big, new factual booklet on Carrier *Hermetic* Centrifugal Refrigerating Machines. Or write Carrier Corporation, Syracuse, New York.

Carrier

air conditioning
refrigeration
industrial heating

Air Conditioning's #1 Problem...



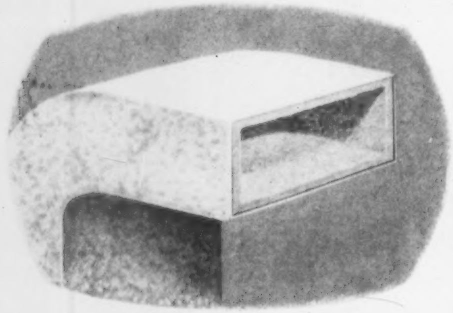
how to move air without "FAN-FARE"

Recent studies show that noise control is one of the prime problems of air conditioning today. Time and again, homeowners and businessmen complain that "fan chatter" and other objectionable noises seriously interfere with their rest and work.

The best possible way to keep your comfort-cooling customers from getting hot under the collar about noise is to install a few feet of ULTRALITE* Duct Liner in the plenum and short supply and return ducts. It's easy . . . it's inexpensive . . . it's effective – yet this simple precaution can make all the difference between a satisfactory and an unacceptable air conditioning job.

That's why it is good practice today for architects and engineers to specify ULTRALITE glass fiber duct liner on every job. That's why contractors who want nothing but satisfied customers line ducts even on jobs where duct liner is not specified.

*Reg. U. S. Pat. Off.



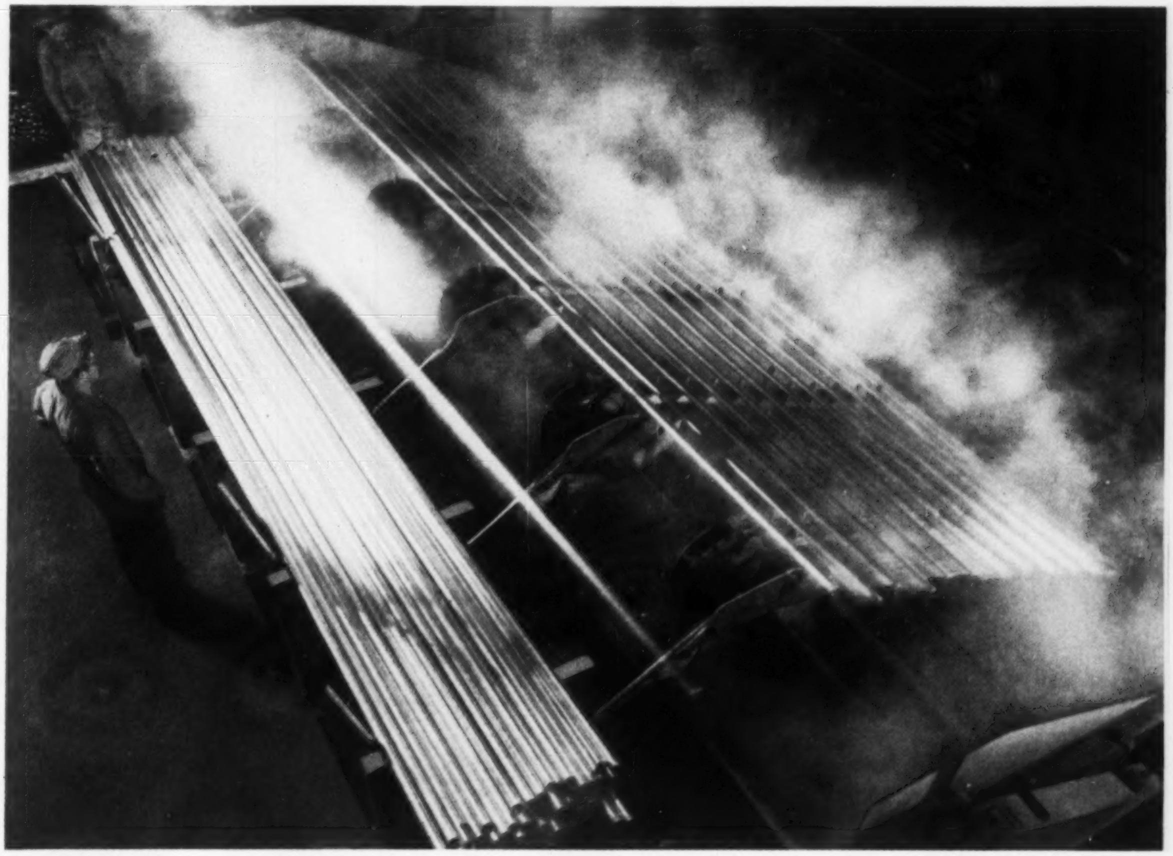
ULTRALITE is a flexible, semi-rigid glass fiber insulation designed specifically as an acoustical duct liner, with excellent sound-absorbing properties. Because of its unique long textile-type glass fiber composition, ULTRALITE is the strongest, most resilient glass fiber insulation. That's why it will not break, chip, delaminate or flake off in the air stream. ULTRALITE is available coated one side to minimize air friction loss. Local stocks in 57 cities are maintained to give you delivery when and where you need it. Your nearby distributor is listed in the Yellow Pages under "Gustin-Bacon Insulations."

GUSTIN-BACON Manufacturing Company GUSTIN gb BACON

Thermal and acoustical glass fiber insulations • Pipe couplings and fittings • Railroad gaskets and supplies

220 W. 10th St., Kansas City, Mo.

NOW!
SPANG CW GALVANIZED FINISH IS BETTER THAN EVER!



New quenching facilities at Etna produce improved bonding, longer pipe life for your installations

Spang takes the lead again in product improvement by the addition of new quenching facilities in the manufacture of galvanized CW Steel Pipe. These facilities handle ½" to 4" pipe after it has been galvanized, cooling it in a sodium dichromate solution from 800 F to 160 F under close control.

This careful quenching results in a better bond between the layer of zinc and the steel surface of the pipe, and increases the ductability of the zinc coating.

Here's what it does for you

First, the stronger bond gives you added assurance that the galvanized finish on Spang CW Pipe will not crack, flake, chip or peel, even under the severest bending strains.

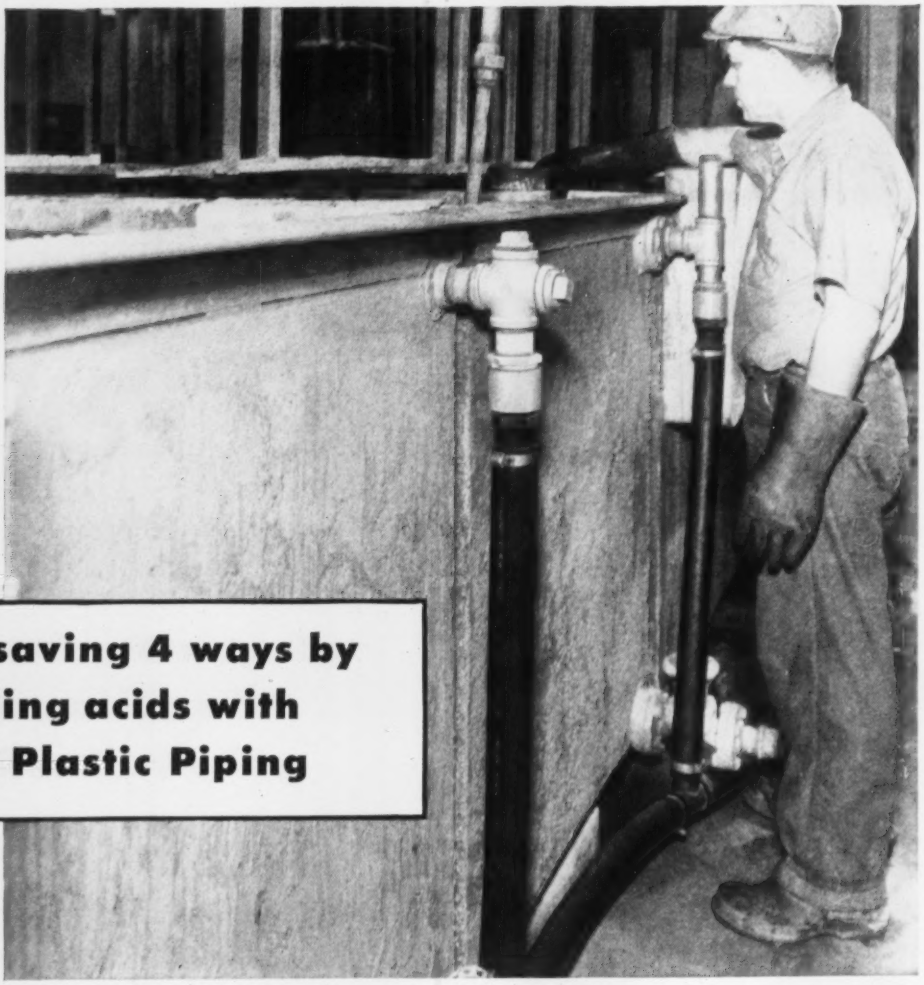
Second, the chemical reaction of the sodium dichromate on the finish retards the formation of white rust on the pipe, an important factor in adding extra service life, especially when ocean shipments are involved. In addition, the galvanized, lustrous finish stays brighter longer.

Add to this all the other *quality-control* features that go into the manufacture of Spang CW, and you have a *top-quality* product for *top-quality* installations . . . a steel pipe that's clean, uniform, strong, easy to work with.

Take advantage of Spang's *quality control*. Order Spang CW Pipe from your nearby Spang Distributor. He carries the complete line.

SPANG-CHALFANT
DIVISION OF THE NATIONAL SUPPLY COMPANY
General Sales Office: Two Gateway Center, Pittsburgh, Pa. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis

SPANG CW® STEEL PIPE



They're saving 4 ways by handling acids with Crane Plastic Piping

THE CASE HISTORY—Globe-Union Inc., leading storage battery builder, in its Milwaukee plant, might have decided plastic piping wasn't for them and let it go at that. Instead, they gave Crane plastic products a fair trial, and here are the results.

On hydrochloric acid lines to zinc-plating tanks, the metal pipe and fittings formerly used had to be replaced completely about every month. Corrosion was the cause.

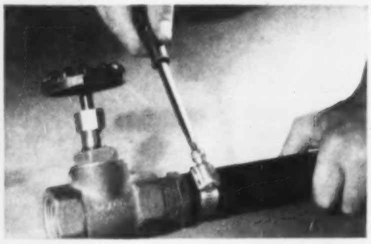
With Crane polyethylene pipe and Crane plastic fittings in this same service, after more than 3 months there is no sign of deterioration and no apparent need of early replacement.

On battery test tanks, Crane plastic piping, exposed to built-up sulphuric acid concentration, looks good as new after more than 4 months' service.

Savings with Crane plastic piping are adding up 4 ways. Plastic cancels the need for costlier metal pipe. It is installed in a fraction of the time it takes for metal pipe and fittings. It reduces installation to a one-man job with simple hand tools. The longer life of plastic is saving replacement, maintenance and housekeeping costs.

Proved in severest services, Crane plastic piping is giving Globe-Union equal satisfaction on many low-pressure air and water lines. Here freedom from sweating is another advantage of plastic.

Once you know the facts of quality-designed, quality-made Crane polyethylene pipe and Crane plastic insert fittings, you, too, will see many opportunities for saving with this modern piping. Call your local Crane Representative today, or write to address below.



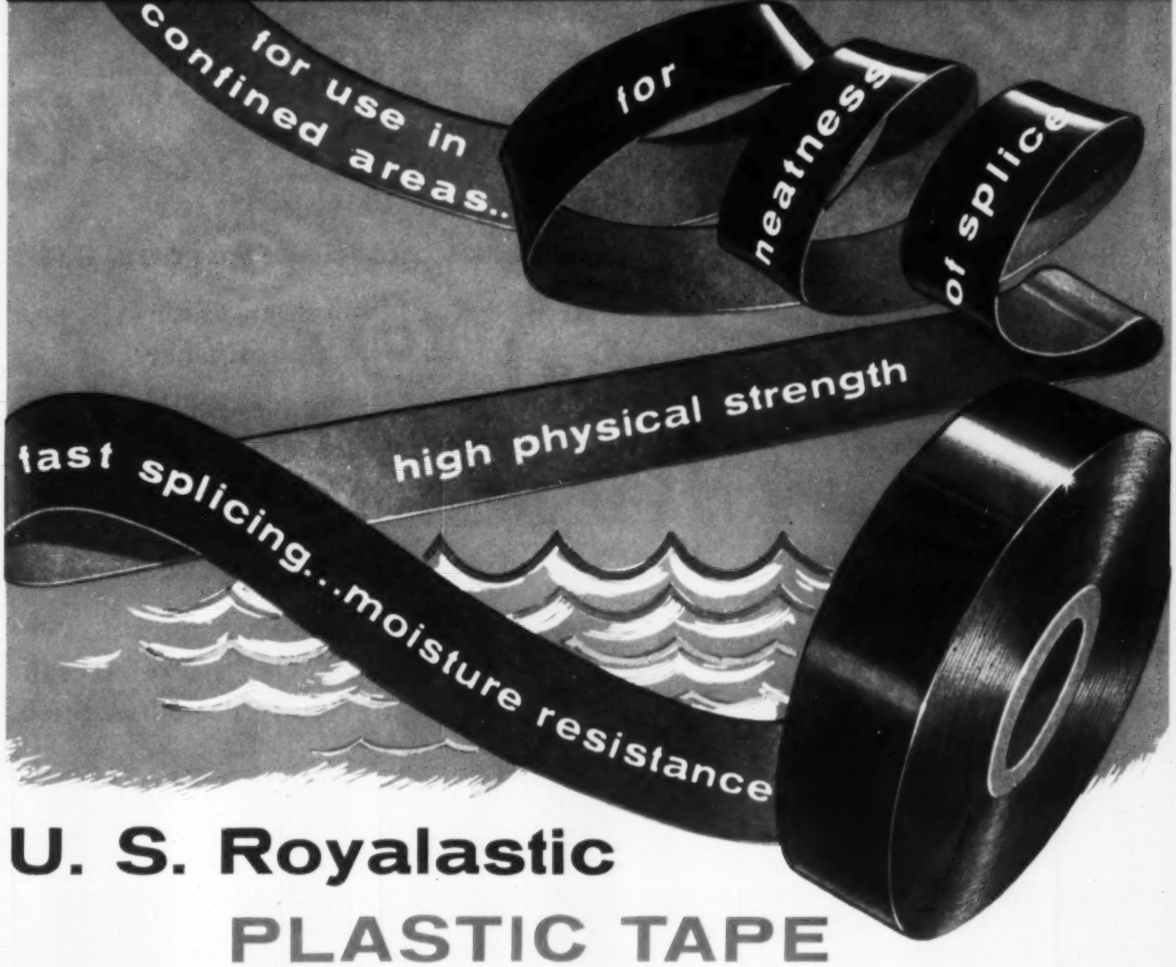
Crane adapter makes plastic-to-metal joints easy

CRANE PLASTIC PIPING

VALVES • FITTINGS • PIPE • KITCHENS • PLUMBING • HEATING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

Always in DEPENDABLE SUPPLY!


for use in confined areas...
for neatness of splice
high physical strength
fast splicing...moisture resistance

U. S. Royalastic
PLASTIC TAPE

US
ROYALASTIC
PLASTIC ELECTRICAL TAPE
UL
UNITED STATES RUBBER COMPANY, NEW YORK

This versatile tape does the work of both rubber *and* friction tapes on many jobs. Complete mechanical and electrical protection. Good tensile strength and high resistance to water, oils, acids, alkalies, corrosive chemicals. Easy to manipulate in cramped spots. Good stretch and adhesion. Approved by Underwriters' Laboratories, Inc.

You can get immediate delivery by getting in touch with any of United States Rubber Company's many distributors, any of the 27 "U. S." District Sales Offices, or write us at Rockefeller Center, New York 20, New York.

US RUBBER

Mechanical Goods Division

United States Rubber

GET PEAK PERFORMANCE

THRU and THRU

buy Sporlan Catch-Alls

The Perfect Filter-Drier
with the Famous Molded Porous Core

Yes, it's easy to see why *only* Sporlan Catch-Alls *can* offer you Thru and Thru Peak Performance.

One look at these famous molded porous Catch-All cores, with their huge tri-dimensional filtering areas, and you know why Sporlan offers Thru and Thru Filtering... instead of just ordinary straining.

You can see, too, why they cannot powder ... cannot pack, and why the refrigerant cannot by-pass or channel around them.

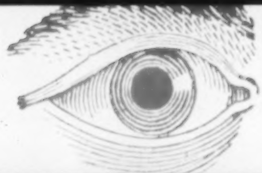
Being molded of minute particles of a highly efficient desiccant, double activated, then immediately sealed... they dry the refrigerant down to an extremely low end point, a point so low that any remaining moisture is absolutely harmless.

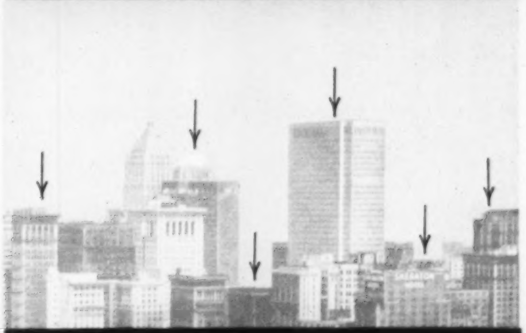
Harmful corrosive acids found in most systems today are adsorbed and retained within the cores themselves.

So... if you want perfectly clean, perfectly dry refrigeration and air conditioning systems... Buy Sporlan Catch-Alls, the Perfect Filter-Drier, and Get Peak Performance Thru and Thru.

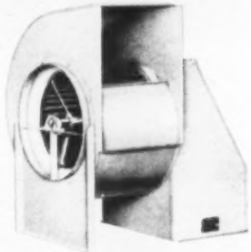
Ask your wholesaler for the Sporlan Bulletin 40-10 today!
You'll find Catch-Alls available in progressive sizes from 3 to 192 Cu. In. in flare or sweat connections.

SPORLAN
VALVE COMPANY 7525 SUSSEX AVENUE ST. LOUIS 17, MO.
EXPORT DEPARTMENT 89 BROAD STREET NEW YORK 4, NEW YORK





A NEW LOOK AT "THE FORGOTTEN FAN"



Up on the roof, "the forgotten fan" is out of sight, out of mind . . . until wind, rain, snow and sleet cause costly breakdowns due to exposure and lubrication neglect. In the past when the heart of a blower was broken by weather, there was nothing for it but to repair or replace.

Today, after a searching look at roof blowers, Utility has a more practical answer: a complete line of quality engineered Enclosed Drive Blowers designed for punishing outdoor duty. Every one has motor and drive completely enclosed for positive protection against dirt, moisture and drastic temperature changes. Permanently sealed, pre-greased ball bearings forever prevent breakdowns due to maintenance neglect.

Best news of all: you pay no premium for this superior performance, due to Utility's progressive production techniques. So, if **you** think it's high time for a new look at blowers for roof installations, be sure to take a good look at the Utility line . . .

A DIVISION OF UTILITY APPLIANCE CORP.

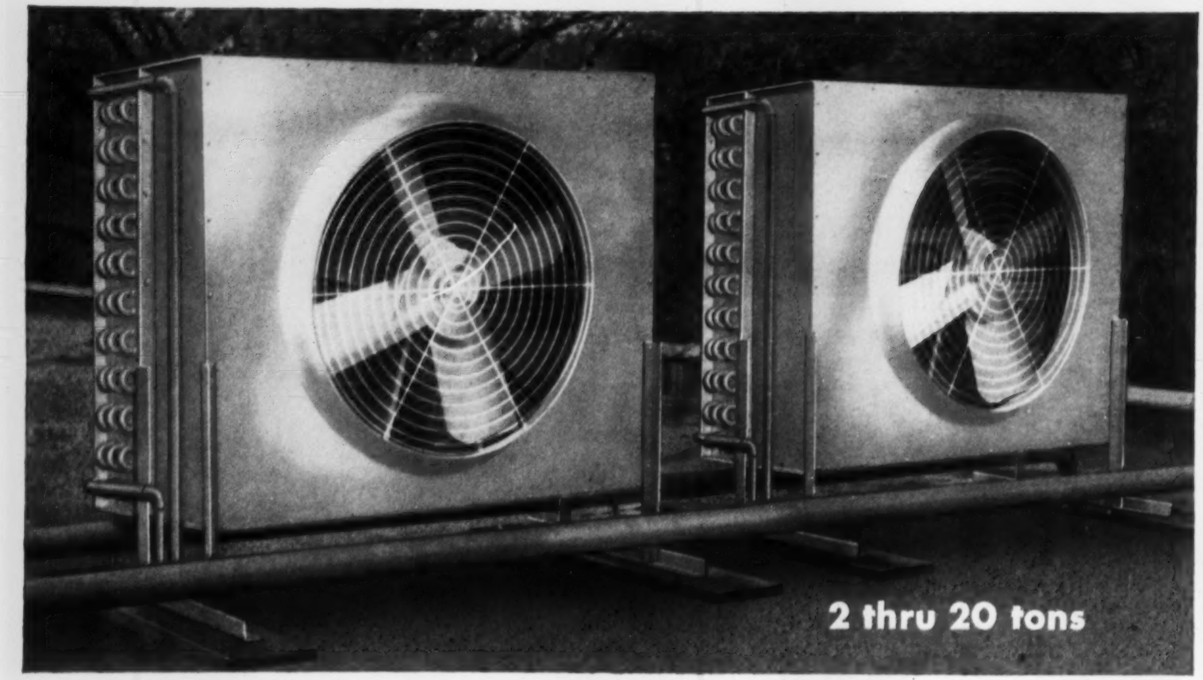
UTILITY FAN CORP.

911 EAST 59TH STREET, LOS ANGELES 1, CALIFORNIA

Manufacturers of heavy
and standard duty blowers for
heating, air conditioning
and ventilating installations.
Producers of blowers
and blower parts for original
equipment manufacturers.
Write for catalogue data.

So Halstead & Mitchell Engineers said:

"LET'S GIVE THIS INDUSTRY A BETTER AIR-COOLED CONDENSER"



Now we proudly call to your attention the Halstead & Mitchell Air-Cooled Condenser for waterless air conditioning and refrigeration. This is today's *better* remote Air-Cooled Condenser.

It is engineered to a new principle called "Co-ordinated Design," and this is engineering pioneering which has coordinated capacity, performance, structural design and appearance to give:

1. Extra-Safe Capacity Ratings — made possible by a unique "dimpled" fin *giving 15% added heat transfer*, as well as a core designed for higher air volumes at lower fan speed.

2. Extra Years of Working Life — insured by exclusive, proven Halstead & Mitchell protection against corrosion; lifetime ball bearings; and a tubing assembly pattern which is self-reinforcing and thus deadens vibration before it starts.

3. Extra-Quiet Operation—which is the direct result of deep-pitch fan blades driven at slow speeds.

4. Extra-Easy Multi-Circuiting—developed for Halstead & Mitchell remote Air-Cooled Condensers by engineers who know what simpler manifolding and selection of circuits can mean when several air conditioning and refrigeration machines must work off a single coil.

Even more important, you know these Air-Cooled Condensers bring you—with their Halstead & Mitchell nameplate—an assurance of the highest quality in the industry. Whether you are jobber, contractor, architect or manufacturer (and we'll be pleased to give quantity quotations), order Halstead & Mitchell "Co-ordinated Design" for *the better Air-Cooled Condenser.*

WRITE FOR BULLETIN AC-100

Halstead & Mitchell

BESSEMER BUILDING, PITTSBURGH 22, PA.

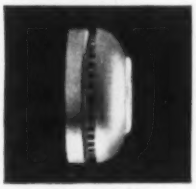
Manufacturer of THE INDUSTRY'S WIDEST SELECTION OF COOLING TOWERS
World's Largest Manufacturer of WATER-COOLED, CLEANABLE CONDENSERS

50
60
70
80
90
H
Honeywell

The thermostat on the wall

The thermostat that was styled with modern architecture in mind

The Honeywell Round is the most popular thermostat sold today—and the first truly *new* design in years. Made in pneumatic, electric, and electronic models for accurate, economical control of heating or cooling in hospitals, apartments, offices, schools, industrial buildings, hotels, motels and homes.



Practical! Ruggedly designed, yet it's precision-built for long service.

Easy to use! Setting and checking are simplified by one easy-to-read scale.

Outmodes annoying, ineffective manual-comfort controls

TODAY there's one sure method of providing constant comfort without tiresome, time-consuming adjustments of switches or valves on the heating or cooling unit.

Key to this one sure method is a thermostat on the wall.

Thermostatic control is automatic—all year. There's no manual on-off operation with resulting cycle of too-hot, too-cool. Provides uniform comfort both winter and summer.

Thermostatic control is sensitive. The thermostat is a precision instrument; it maintains a set temperature accurately.

Thermostatic control is convenient. Unlike switch or valve types of heating control, the thermostat is always conveniently located. Changing a setting is easy and sure.

Honeywell thermostat systems are versatile. Only Honeywell makes all three types of thermostats—pneumatic, electric, electronic. Each group offers a choice of many models.

For complete information and help in selecting thermostatic controls for your clients, call your nearest Honeywell office. For more details on the Honeywell Round, write Honeywell, Dept. HA-3-40, Minneapolis 8, Minn.

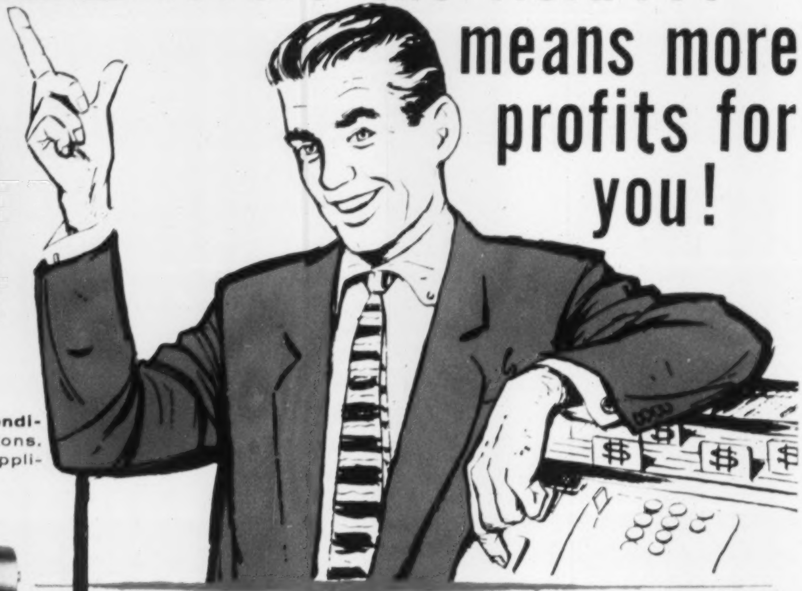
MINNEAPOLIS
Honeywell

Sign of sure comfort—a thermostat on the wall

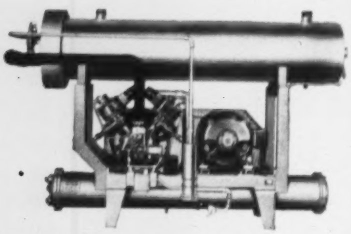
H
HONEYWELL

First in Controls

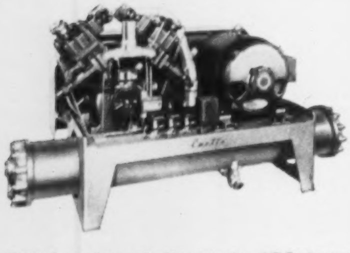
Curtis covers the field . . . means more profits for you!



Packaged Air Cooled Air Conditioning Units — 2 through 7½ tons. Residential and Commercial applications.



Packaged Liquid Chillers — 7½ to 100 tons—F-12 or F-22. With room console units to provide controlled cooling and heating without duct work.



Condensing Units up to 100 tons— F-12 or F-22.

There's additional profit when you sell the complete Curtis line. Curtis equipment sells easily because it is backed by one of the oldest and most reliable names in the business and it's *competitively priced.*

Curtis-built compressors have an enviable record of trouble-free performance, long life and high efficiency.

Curtis Air Conditioning and Refrigeration equipment is nationally advertised to make your selling job easier.

You can count on Curtis for Sales Plus every time.

Air Handling Units . . . Cooling Towers and Evaporative Condensers to match.

Remember
You can
COUNT on

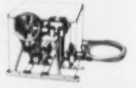
Curtis

MANUFACTURING COMPANY
Refrigeration Division
1950 KIENLEN AVE., ST. LOUIS 20, MO.

INDUSTRIAL AIR COMPRESSORS

AUTO LIFTS

AIR CYLINDERS



CAR WASHERS

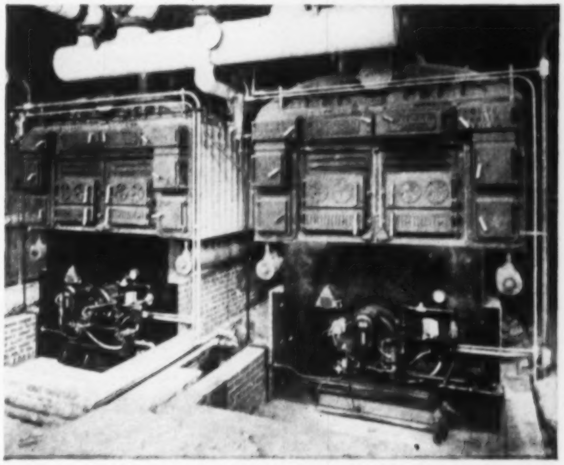
AUTOMOTIVE AIR COMPRESSORS

1854 · 1956
our 102ND year
OF SUCCESSFUL MANUFACTURING EXPERIENCE

CM-4

Voted Most Unpopular

. . WITH SCHOOL CHILDREN



Two 10-section oil-fired 60 Smith boilers installed in the Elementary School at Penn Wynn, Pa., in 1930, were enlarged to 26 sections each in 1949, and are serving the second generation . . . and there are more of them.

H. B. SMITH BOILERS

Well, you can hardly blame the youngsters — it's a long, long time between school closings due to failure of an H.B. Smith cast iron boiler. You see, these boilers are virtually breakdown-*proof*, due to their header-type construction . . .

But give the children a few more years: they'll be parents paying taxes to retire new bond issues for more classrooms for more children . . .

They'll vote "MOST POPULAR" when they learn that the H. B. Smith boilers, installed 20 years before, are still in first-class condition, and can be expanded with new cast iron boiler sections to carry the increased heat load . . . saving thousands of dollars.

. . . "MOST POPULAR" when they learn that there is no boiler tube replacement item in the maintenance budget, because H. B. Smith boilers have integral cast iron water tube sections which last as long as the boiler.

. . . "MOST POPULAR" as the years pass, because of fuel economy, quick heating, easy conversion, ability to take overloads — and, of course, *low maintenance and repair* . . .

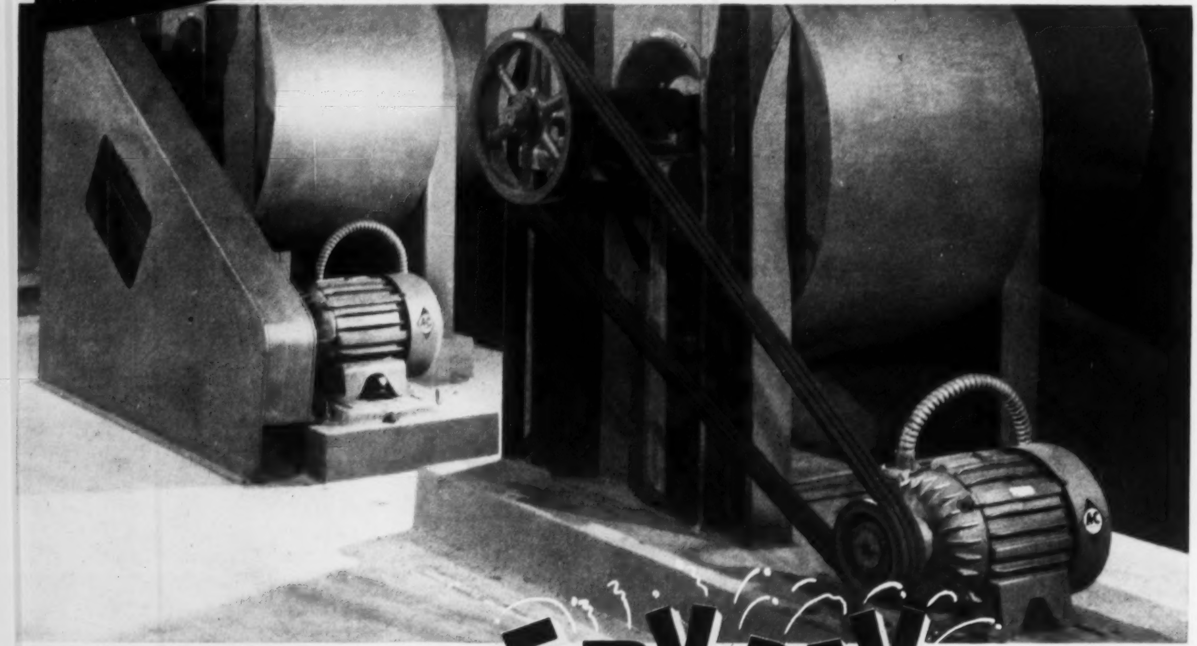
It's not unusual for an H.B. Smith cast iron boiler to serve three generations of children in a school.

If *you* want to be popular with taxpayers year after year, specify H. B. SMITH cast iron boilers for that school boiler plant.

CAST IRON BOILERS

H. B. SMITH CO., INC., WESTFIELD, MASSACHUSETTS • *Established 1853*

There's MORE Cooling Surface in these deep-ribbed **MOTORS**



No Day is

with these Allis-Chalmers MOTORS

● Frying of insulation is impossible under normal conditions with the extra-large cooling surface of Allis-Chalmers rib-type TEFC motors. The result — you expect and get longer motor life.

The engineered partner of A-C motors is Allis-Chalmers control.

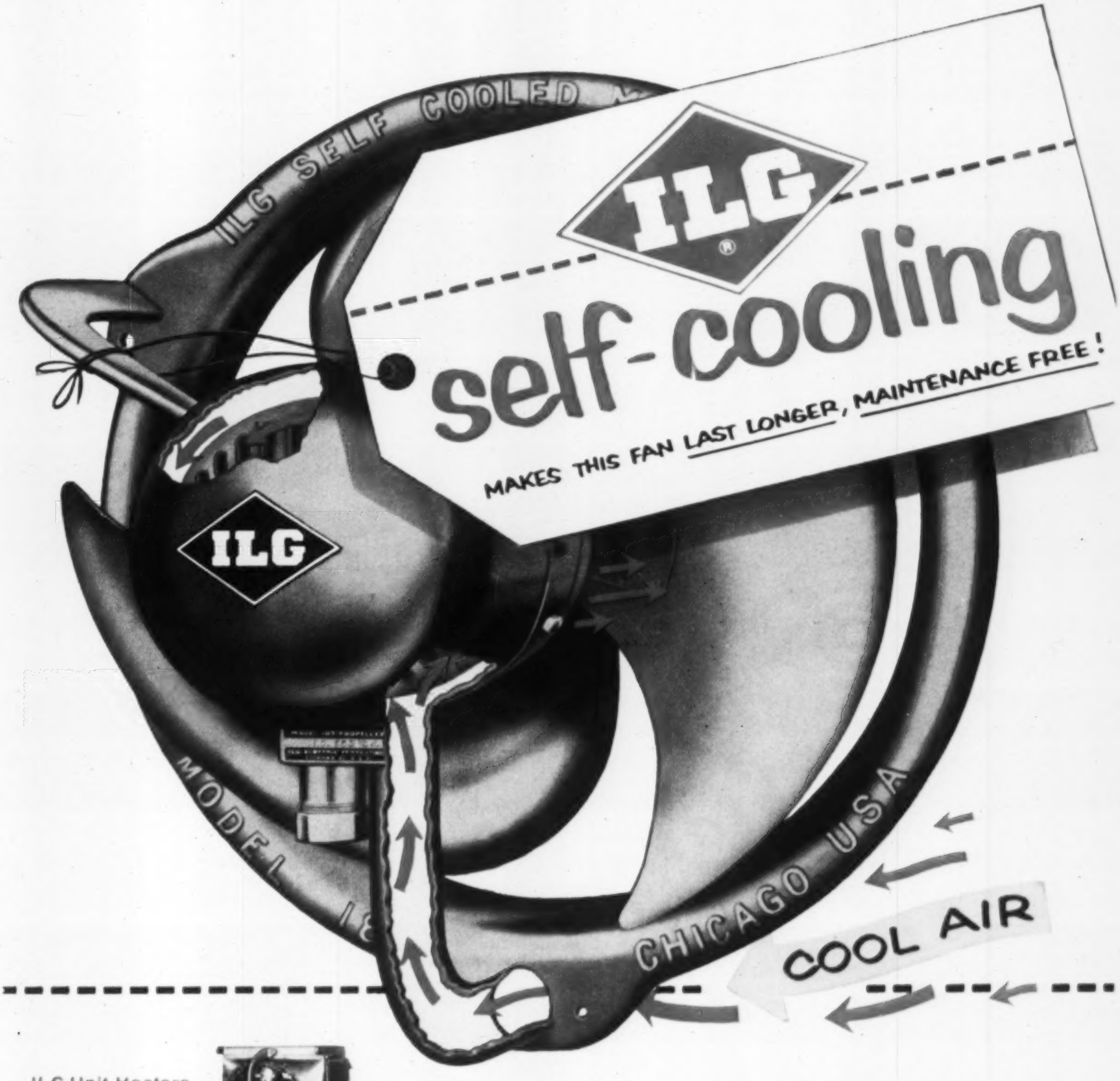
Get Complete Information

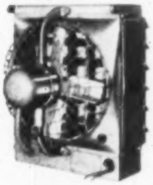
As a new machinery component or as replacement, specify Allis-Chalmers. Discuss your particular application with your nearby A-C distributor, A-C district office, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A 4944





ILG Unit Heaters
The complete line—steam, hot water, gas or electric—with capacities ranging from 18,600 to 286,000 BTU.

ILG Centrifugal Fans
Designed for a wide variety of pressure and volume requirements — certified capacities ranging from 374 CFM to 116,400 CFM.

ILG Power Roof Ventilators
Long-lasting, quiet, easy to install, leak-proof—provide efficient ventilation independent of wind and weather.

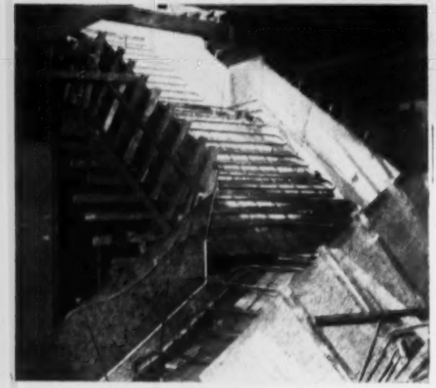
INSTALL Ilg SELF-COOLED PROPELLER FANS

The secret of ILG's better design is the exclusive *self-cooled* motor! Clean, cool, fresh air is drawn into the motor enclosure through an *outside vent pipe*. The motor stays clean and cools itself — dusty, greasy air can never reach it to interrupt service or shorten its life! ILG self-cooled fans have the lowest operating and maintenance cost of any open type motor combined with a fully enclosed motor . . . a savings up to *10% on power costs alone!*

ILG ELECTRIC VENTILATING CO.
2826 N. Pulaski Road,
Chicago 47, Illinois

ILG
50TH
ANNIVERSARY
1906-1956

Giant Snow Melting System for Staten Island Ferry Building features *"snowless"* stairway



Snow melting coils in place on stairway forms . . . and freshly concreted stairway. Handrails to be installed later.

Reconstruction of the Manhattan Terminal of the Staten Island Ferry, operated by New York City's Dept. of Marine and Aviation, includes an extensive snow melting system. The long curving ramp, which starts at street level and expands into a semicircular walkway on the second level, is completely fitted with snow-melting coils, as are the walkways.

A unique feature of the installation is that an open stairway from the street to the top of the ramp has also been equipped with snow-melting coils—one length of 1" pipe in the tread of each step.

Approximately 14 tons of 1" NATIONAL Steel Pipe were used in the grids, and about 5 tons of sizes up to 3" were employed as headers, connecting pipes, etc.

Architects, engineers, and contractors have been specifying USS NATIONAL Steel Pipe for over 60 years as the "standard" choice for conventional plumbing and heating systems.

The inherent characteristics of NATIONAL Pipe are well known—smooth, uniform bending; sound, strong welding properties; and extra-long service life—characteristics that make NATIONAL Pipe ideal for such applications as snow melting and radiant heating, and give it the reputation for dependability that it enjoys. Such a well-deserved reputation inspires confidence—a nation-wide confidence that has made USS NATIONAL Pipe the largest selling pipe in the world. Write for free descriptive literature.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS NATIONAL PIPE

UNITED STATES STEEL

STRUTHERS WELLS PRODUCTS

●

BOILER DIVISION

BOILERS for Power and Heat
High and Low Pressure
Water Tube . . . Fire Tube
Package Units

PROCESSING EQUIPMENT DIVISION

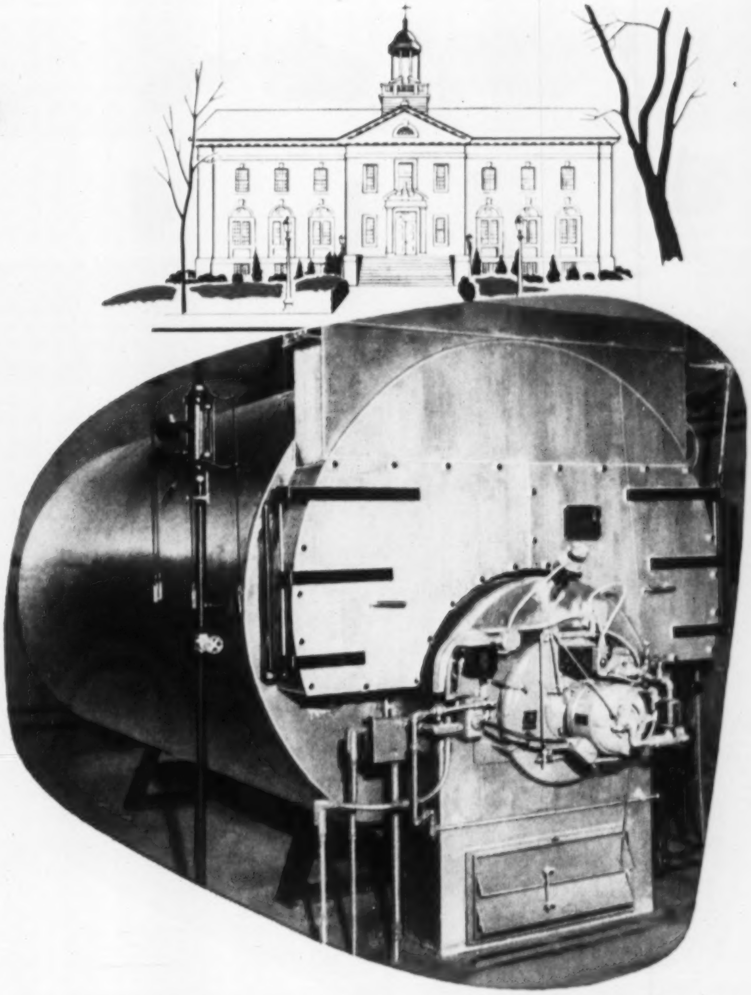
Crystallizers
Direct Fired Heaters
Evaporators
Heat Exchangers
Mixing and Blending Units
Quick Opening Doors
Special Carbon and Alloy Processing Vessels
Synthesis Converters

FORGE DIVISION

Crankshafts . . . Pressure Vessels
Hydraulic Cylinders
Shafting . . . Straightening and Back-up Rolls

MACHINERY DIVISION

MACHINERY for Sheet and Structural Metal Forming
Tangent Benders
Folding Machines
Roller Table and Tumble Die Bending Machines
Press Brakes
Punching and Notching Machines
Forming Dies



Keeps Gym Comfortable—
Never works up a sweat!

TITUSVILLE
Scotch Marine Heating Boilers

Chosen for its dependable quick steaming quality, compactness and low headroom, this Titusville SOH-242 Boiler easily handles the heating requirements of Dickinson College's gymnasium and several nearby buildings on the campus at Carlisle, Pa. ● Let us detail the Scotch Marine economy advantages for your own applications—Write!

Heating Contractors: H. B. McClure Company, Harrisburg, Pa. Engineers: Whitman, Reguardt & Assoc., Baltimore, Md.

THE TITUSVILLE
IRON WORKS COMPANY
A Division of
Struthers Wells

TITUSVILLE, PENNSYLVANIA
Manufacturers of A COMPLETE LINE OF BOILERS FOR EVERY HEATING AND POWER REQUIREMENT
PLANTS AT TITUSVILLE, PA. AND WARREN, PA.
Offices in Principal Cities

NOW IT CAN BE

SOLD

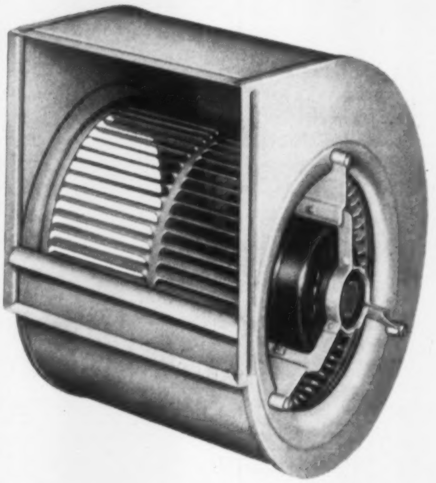
Dealers have found that one of the biggest drawbacks to sales of residential heating-cooling combinations is the problem of *noise*. Now progressive manufacturers are supplying dealers with larger units equipped with Utility's new "Big Boy" Direct Drive Blowers. "Big Boy"—a burly brute of a fan— is packed with *quiet* power that proves this equipment *can* be sold when it has the added sales appeal of silence.

With airflow capacity great enough to handle up to 125,000 BTU—3-ton heating-cooling combinations, "Big Boy" delivers approximately 1,400 to 1,500 CFM at a static pressure of 0.80" WG. It's the most quietly powerful direct drive blower now available.

Utility was first with a line of silent direct drive blowers with Neoprene hubs. Now Utility is first again! Here is a silent direct drive blower with Neoprene hubs and super-quiet permanent split capacitor motor. Why not get together with your manufacturer on the proposition that silence is a golden opportunity for increased sales—for him, for *you?* Remember only Utility's "Big Boy" Direct Drive Blower gives your equipment the power it needs *and* the silence that sells it.

Check with Utility for blowers and blower parts in any combinations. You'll find that . . .

YOU CAN'T MATCH UTILITY FOR PRODUCT AND PRICE!



UTILITY FAN CORP.

911 East 59th Street, Los Angeles 1, California

Manufacturers of heavy
and standard duty blowers for
heating, air conditioning
and ventilating installations.
Producers of blowers
and blower parts for original
equipment manufacturers.
Write for catalogue data.

UTILITY

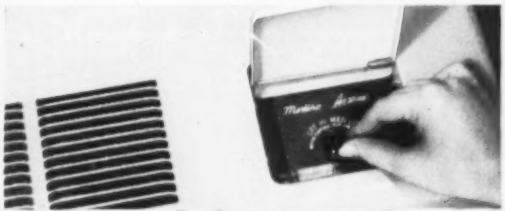
A DIVISION OF UTILITY APPLIANCE CORP.

For the architect, builder, or buyer who would "like to air condition" but hesitates because of expense . . . check

Modine AIRditioners

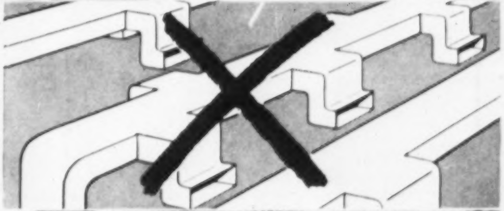
COOL, HEAT, VENTILATE

Whether you're planning to build or remodel, Modine AIRditioners are designed for year 'round heating, ventilating and air conditioning. Individual controls keep room occupants comfortable, satisfied . . . save owners money on fuel costs. Ultra-quiet, resiliently suspended motors and fans (1050 rpm) meet the most exacting noise-level requirements.



ELIMINATE EXPENSIVE DUCT WORK

Modine AIRditioners combine the best of central and unit type systems. They heat with hot water from a central boiler, cool with cold water from a central chiller. Same piping — water supply and return plus drain — is used for both. Operation of fan ventilates rooms during intermediate seasons.



IN STYLES AND SIZE FOR EVERY NEED

Sleek, modern lines add dignity and decor to any design motif . . . enhance livability of hotel, motel, office, apartment or home. Four distinct types to choose from — ceiling, overhead, concealed and console models — all styled by Jean Otis Reinecke.

Air Conditioning
Modine
Airditioners

A 1296

NEW, FREE BULLETIN DETAILS ADVANTAGES

Ask the Modine representative listed in your classified phone book for Bulletin No. 755. Or write — MODINE MFG. CO., 1509 DeKoven Ave., Racine, Wis.

Modine AIRditioners

TRADEMARK

DOLLINGER

STAYNEW FILTERS FOR EVERY VENTILATING APPLICATION

. . . .

STAYNEW AUTOMATIC AIR FILTERS

Designed for filtering large air volumes efficiently, these self-cleaning filters give you *positive protection* against oil entrainment in the air stream. This protection is provided by an exclusive Staynew feature—a second dry curtain providing a double filtering action. Ask for Bulletin 500.

ELECTRO-STAYNEW PRECIPITATORS

Highly efficient—removes 90% of all air-borne dirt, including smoke, dust, pollen, oil mist. Ionizer and Collector in one unit. Available in single unit of 1200 and 1800 CFM; any capacity in multiple units. Ask for Bulletin 400.

. . . .

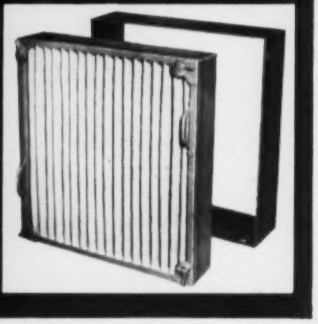
VISCOUS PANEL FILTERS

Low cost, permanent, washable type for locations where highly efficient filtration is not required. Large dust-holding capacity with amazingly low resistance to air flow. Unsurpassed for ease of cleaning. Ask for Bulletin 700.

. . . .

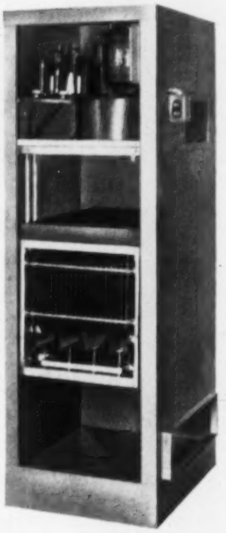
DRY PANEL FILTERS

Highly efficient for heavy duty Ventilation work. Operates with any filtering medium that comes in sheet form and can be crimped. Preformed media can be inserted quickly and easily when required. Ask for Bulletin 600.



ELECTRO-STAYNEW MIST COLLECTOR

Provides self-contained ventilating system for individual machine tools. Removes air contaminated with oil, smoke, grit, and chips and returns clean air to shop. Saves you hundreds of dollars in building maintenance expense and lost man-hours due to employee sickness. Ask for Bulletin 420.



AFI MEMBER AIR FILTER INSTITUTE

Whatever your filtering problem, wherever you are, there's a Dollinger representative ready to help you solve it with a *Staynew* filter—the *only* complete line of industrial and ventilating filters available.

Write today, and ask for catalogs describing the filters illustrated above. Dollinger Corporation, Dept. 9, Centre Park, Rochester 3, N. Y.

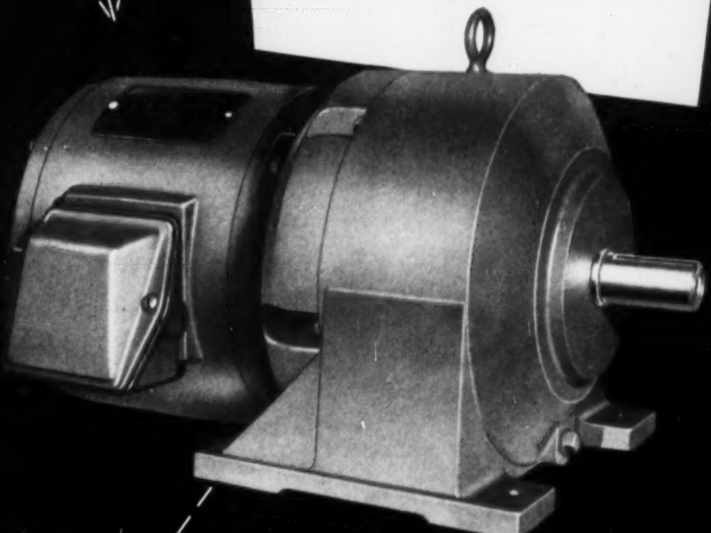
DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

DOLLINGER CORPORATION

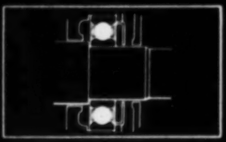
ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS
ELECTROSTATIC FILTERS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS
VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS • HIGH PRESSURE FILTERS
AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

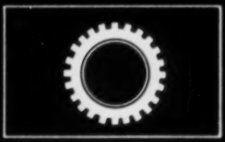
Don't overlook what you can't see



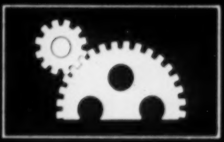
You can't always see what makes a gearmotor outstanding. It's the attention paid to small design details that makes the difference. Here are a few of the details that make the new Reliance Gearmotor stand above the rest.



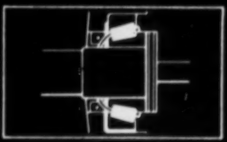
FOOLPROOF METERMATIC motor bearing lubrication and oil bath gear lubrication for long-life protection against wear.



INDUCTION HARDENING of the tough alloy steel gears gives a perfect combination of wear resistance and strength.



SIMPLIFIED GEARING with few moving parts reduces friction losses and lessens chances of breakdown.



THRUST BEARINGS handle heavy overhung loads safely by placing strain on the frame instead of the shafts.

Find out the complete story for yourself—contact your Reliance representative or write for Bulletin E-2408.

E-1509

REDUCE
SPEED

RELIANCE ELECTRIC AND ENGINEERING CO.

CLEVELAND 10, OHIO • OFFICES IN PRINCIPAL CITIES

Canadian Division: Welland, Ontario

Want to Get 90 Minutes Work FROM EVERY Hour OF PIPE FITTING?

Whether on new construction or maintenance, there's a lot of hand work in every piping job. The *right* tools can mean the difference between profit and loss, or between an easy job and a hard one.

We at Reed's have been designing and building *good* pipe tools for more than half a century. And we're making them *better* all the time.

Of the six Reed tools shown here, five have been introduced within the last three years. And every tool on this page has exclusive performance features which can save as much as half of the time and energy you're using with ordinary tools. Check up and see!

. . . in a Vise or Pipe Tool
if it's Reed—it's Right!

CHAIN WRENCH

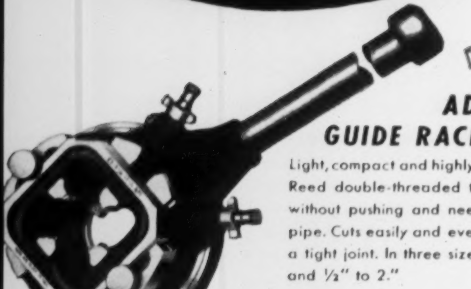
Does everything an ordinary pipe wrench will do . . . and a great deal more. Gets into tight corners; holds or turns any shape. Rachet-like action works in either direction. 10" to 60" handle lengths. Renewable jaws.

•

HINGED 4-WHEEL CUTTER

Until you've used it, you can't believe how quickly this completely new tool cuts off cast iron or steel pipe. Tracks perfectly, cuts easily and clean . . . in ditch work, in tight corners or in the open. In five sizes for pipe to 12 inches.

•



ADJUSTABLE GUIDE RACHET THREADER

Light, compact and highly efficient. Features the exclusive Reed double-threaded throat, chip-ejecting die. Starts without pushing and needs no lead screw even for 2" pipe. Cuts easily and every thread is clean and true for a tight joint. In three size ranges: ⅛" to 1"; ¼" to 1¼" and ½" to 2."

RACHET REAMER

The original and only genuine self-feeding rachet reamer. Needs no pushing. Cuts burr fast without binding or gouging. Capacity ¼" to 2."

•

CHAIN BENCH VISE

A sturdy and greatly improved chain bench vise. Chain drops naturally into position and locks automatically. Easy-to-use handle ends fumbling and skinned knuckles. In five sizes with capacities from ⅛" to 2" to ½" to 8."

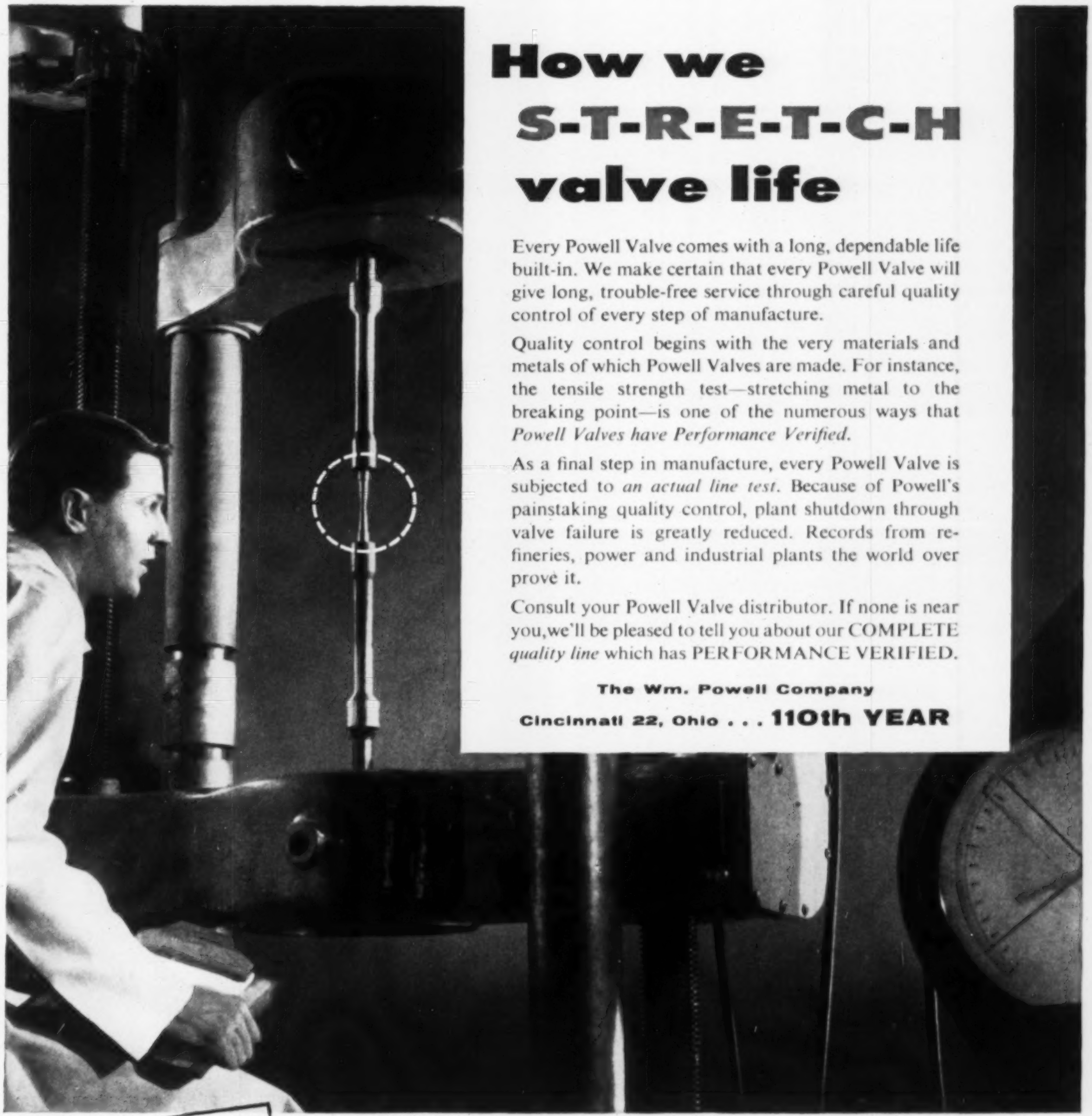
FOLDING TRAY TRIPOD VISE

The famous folding tray tripod is available with the long-jaw yoke vise or the new chain vise head. Folds compactly, carries easily. Sets up instantly, solid as a rock, and won't collapse while you're working. Yoke vise capacity ⅛" to 2½"; chain vise capacity ½" to 4."

☆ - - - - -

The distributors who feature Reed Pipe Tools believe in the best for their customers. You'll enjoy doing business with them.

REED
TRADEMARK
MANUFACTURING COMPANY
ERIE, PENNSYLVANIA • U.S.A.



How we S-T-R-E-T-C-H valve life

Every Powell Valve comes with a long, dependable life built-in. We make certain that every Powell Valve will give long, trouble-free service through careful quality control of every step of manufacture.

Quality control begins with the very materials and metals of which Powell Valves are made. For instance, the tensile strength test—stretching metal to the breaking point—is one of the numerous ways that *Powell Valves have Performance Verified.*

As a final step in manufacture, every Powell Valve is subjected to *an actual line test*. Because of Powell's painstaking quality control, plant shutdown through valve failure is greatly reduced. Records from refineries, power and industrial plants the world over prove it.

Consult your Powell Valve distributor. If none is near you, we'll be pleased to tell you about our COMPLETE *quality line* which has PERFORMANCE VERIFIED.

The Wm. Powell Company
Cincinnati 22, Ohio . . . 110th YEAR

PERFORMANCE
PV
VERIFIED

FIG. 3003—Steel Gate Valve For 300 Pounds W.S.P.

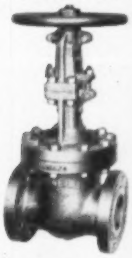


FIG. 150—Bronze Vulcanized Composition Disc Globe Valve For 150 Pounds W.S.P.

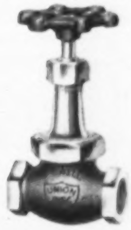
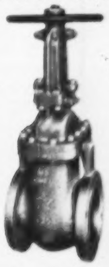
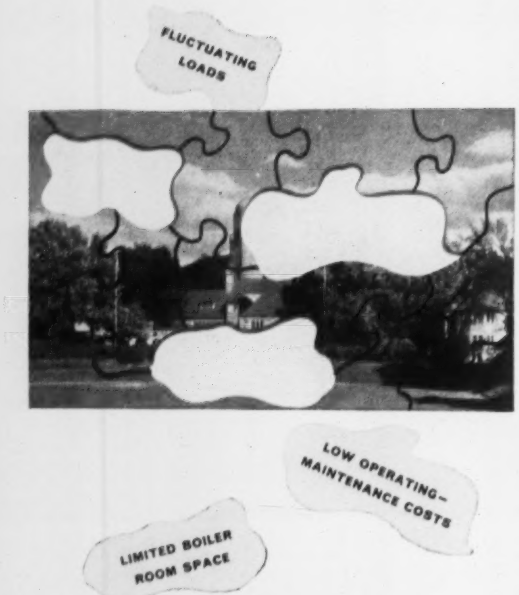


FIG. 1793—Iron Body Bronze Mounted Gate Valve For 125 Pounds W.S.P.



POWELL VALVES

BRONZE, IRON, STEEL AND CORROSION RESISTANT VALVES.



HOW A JIGSAW HEATING PUZZLE WAS SOLVED

KEWANEE reserve plus rated boilers

MET SCHOOL HEATING NEEDS

A jigsaw puzzle heating problem . . . that's what it looked like at the Cranbrook School for Boys, Bloomfield Hills, Michigan, since the heating needs were so varied. But every puzzle piece fell into place when Kewanee Reserve Plus Rated Boilers were installed, because all heating needs were solved. Here's the way it worked:

Problem 1: Limited boiler room.

Solution: Two compact Kewanee Scotch Type Boilers with 50% reserve power guaranteed adequate heat under all conditions.

Problem 2: Fluctuating loads—boiler turned off nightly, turned on by stages in the morning.

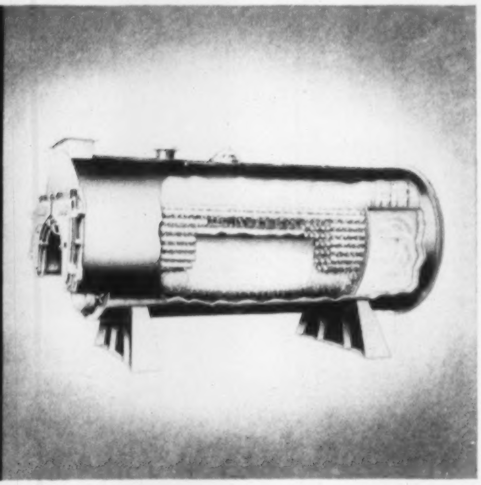
Solution: Kewanee Boilers had sufficient reserve to assure a fast, dry steam when needed to give quick heat.

Problem 3: Low operating—maintenance costs.

Solution: Since Kewanee Reserve Plus Rated Boilers certify 50% extra power built in, they operate at "cruising speed." Result—less fuel used, less wear on boiler, greater efficiency delivered.

Kewanee Reserve Plus means boilers are rated on nominal capacity, with adequate power to take care of present needs, emergencies and future expansion. Boilers rated on maximum capacity are inadequate for today's fast growing school needs. Next time select Kewanee Boilers.

Cranbrook School for Boys, Bloomfield Hills, Michigan
Heating Contractor: Laing Plumbing & Heating Company, Pontiac, Michigan
Engineer: Snyder & McLean, Detroit, Michigan



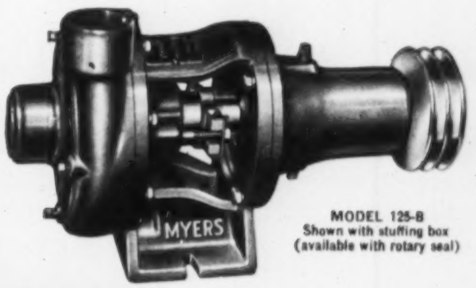
Kewanee LM-800 Series for 15 lbs. steam or 30 lbs. water installed in the Cranbrook School for Boys.

KEWANEE BOILER DIVISION
of American-Standard
101 FRANKLIN STREET, KEWANEE, ILLINOIS

KEWANEE BOILERS

You can depend on Kewanee engineering

MODEL 125-M
Shown with stuffing box
(available with rotary seal)



MODEL 125-B
Shown with stuffing box
(available with rotary seal)

NOW...a complete line
of centrifugal pumps for air conditioning from...
MYERS

MODEL 100-B
Rotary seal only

MODEL 100-M
Rotary seal only

FULL RANGE OF SIZES
⅓, ½, ¾, 1, 2, and 3 horsepower, motor-mounted or belt-driven models.

TWO CASING SIZES
1″ x 1¼″ or 1¼ x 1½″.

ALL-BRONZE IMPELLER
Accurately balanced for smooth operation.

REMOVABLE BRONZE WEARING RINGS
Easily replaced for longer pump life.

ROTARY SEAL
Eliminates leakage (stuffing box may be specified on "125" models.)

CORROSION-RESISTANT SHAFT
Stainless steel for trouble-free service.

WIDE RANGE OF CAPACITIES AND HEADS
Capacities to 90 GPM. Heads up to 135 feet.

Write today *for Bulletin 210 on* Myers *Centri-Thrift Pumps.*

Myers **PUMPS** WATER SYSTEMS AND WATER SOFTENERS

The F. E. Myers & Bro. Co., Ashland, Ohio

Here it is...!

THE NEW "48-FRAME" MOTOR DESIGN THAT GIVES YOU Century INDUSTRIAL QUALITY

Everything you asked for and more. Smaller, yes... and better, too. Here is traditional Century dependability, smooth-running and quietness under load... now skillfully engineered into the compact new "48-Frame" design.

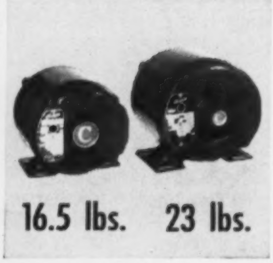
These great new Century "Industrial Quality" motors are now available in sizes from 1/20 to 1/3 H.P.... developed specially for industrial users.

ON NEW EQUIPMENT OR FOR REPLACEMENT...

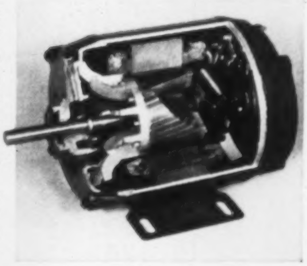
when you see the red "C" on the new weight-saving, space-saving "48-Frame" motors, you're assured of Century's *traditional industrial ruggedness.* For information and for fast service, call or write your nearby Century District Sales Office or Authorized Distributor.

We Invite Your Comparison of...

engineering — Weight savings up to one-third are made possible without "skimping" on the vital "active materials", simply by eliminating dead weight and using new materials. The result is smaller-diameter motors that are not merely "just as good" but actually superior to the famous Century "56-Frame."



design—For time-saving maintenance, "GITS"-type oilers for sleeve bearings are placed high on the end-brackets, allowing easy oiling from either end of the motor... cluster-type integrally cast fan at the rear end of the rotor draws a steady stream of cooling air over the coilheads... "Square" stator iron permits air to pass between the core and shell, cooling the whole width.



Performance-Rated©
MOTORS
1/20 to 400 H.P.

CENTURY ELECTRIC COMPANY

56

1806 Pine Street • St. Louis 3, Missouri • *Offices and Stock Points in Principal Cities*

ANOTHER
Sarcotherm
INSTALLATION

Beardsley Terrace Housing, Bridgeport, Conn. • Engineers: Frederick M. Hill and Paul D. Harrigan, New Haven.
Architects: Lindsay & Johnson, Bridgeport • Heating Contractor: Bridgeport Pipe & Engineering Co., Bridgeport. • General Contractor: E & F Construction Co., Bridgeport.

Here's why Mechanical Engineer is **enthusiastic about Sarcotherm in 1200-family 16-building project**

As Mechanical Engineer Paul D. Harrigan writes, "Sarcotherm steam heating controls in Beardsley Terrace Housing...working perfectly through extreme part of Winter as well as in Spring...sensitive, accurate and flexible...the Housing Authority, the architects and we ourselves are entirely satisfied."

Sixteen Sarcotherm Weather-Compensated Controls serve Beardsley Terrace. Of the continuous, modulated flow design, they provide individual zone control for the steam heating of each building. Precisely engineered orifice plates assure the proper steam flow to each heating unit.

COMPLETE SYSTEM — UNDIVIDED RESPONSIBILITY

Sarcotherm engineers cooperate in the preparation of working drawings and wiring diagrams for each job, and follow through with on-the-job help and supervision of installation.

Sarcotherm assumes undivided responsibility because the Sarcotherm System is COMPLETE—includes zone controls, panels, thermostats and steam specialties—traps, valves, and air eliminators.

Write for further details. Sarcotherm Controls, Inc., Empire State Building, New York 1, N. Y.

FEATURES OF SARCOTHERM CONTROL SYSTEMS

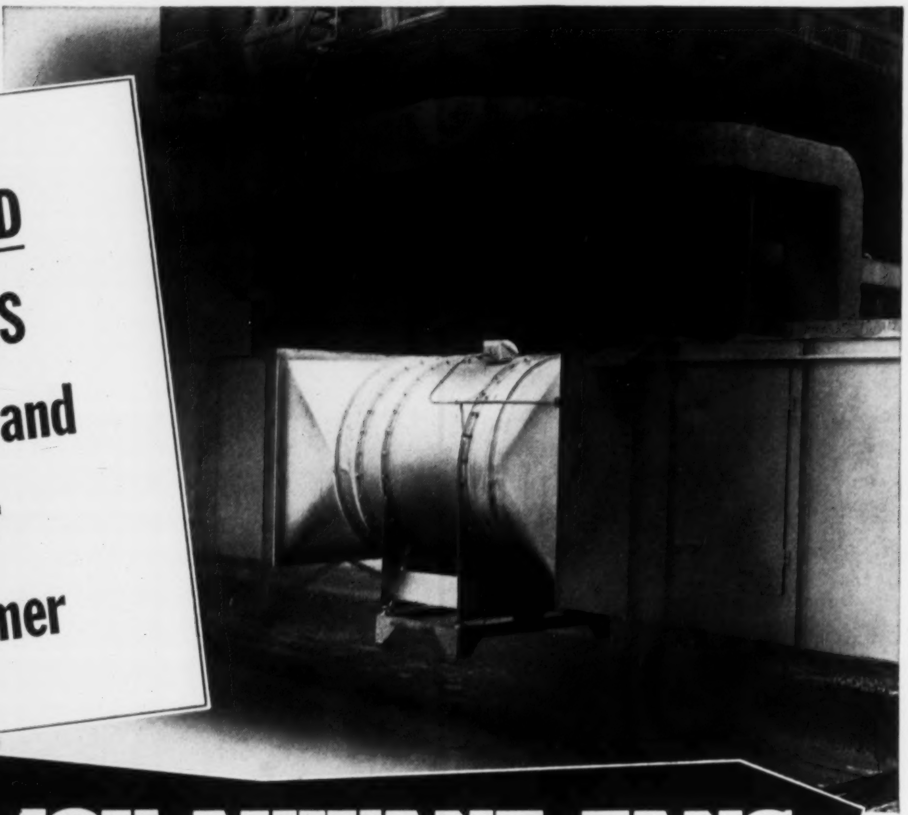
1. **Easy to install**—working drawings and wiring diagrams furnished for each job.
2. **Easy to maintain**—because of simplified construction, fewer parts.
3. **Easy to adjust**—to any desired setting.
4. **Engineered orificing**—assures even heat flow to all units from the start.
5. **Undivided responsibility**—by one maker, Sarcotherm, for the complete control system.

Sarcotherm

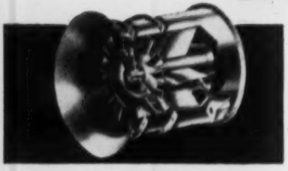
An affiliate of SARCO COMPANY, INC.

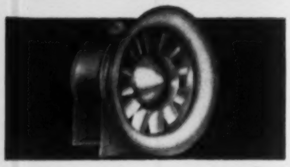
WEATHER-COMPENSATED CONTROLS FOR **STEAM, HOT WATER AND RADIANT** *HEATING*

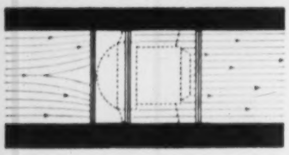
PLANNED SAVINGS for you and your customer



with JOY AXIVANE FANS







SAVE POWER The unique vaneaxial design utilizes aerodynamic blades with close tip tolerance. Internal vanes recover the rotative energy of the air from the blades and convert that energy to velocity and pressure. Result: high performance at low cost.

SAVE SPACE In-line design permits installation right *in the duct.* The photograph above, at Minneapolis-Honeywell Company, illustrates this feature. The fan, which supplies air to two large floors, utilizes an area only 54" in diameter and 26½" long. Result: exceptional economy of space.

SAVE INSTALLATION COSTS In-the-duct mounting of Joy Axivane Fans is easily and quickly accomplished, and requires only the simplest supports. Result: reduced labor time and costs.

Thus, the remarkable efficiency of the Joy Axivane Fan design . . . in contrast with other air-moving machines . . . gives you great savings in power, space, and labor. . . . And remember, the bigger the job, the greater the margin of benefit you enjoy. For full details, write **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Write for FREE Bulletin 55-41

Consult a Joy Engineer

for VANEAXIAL FANS • COMPRESSORS • OXYGEN GENERATORS
VACUUM PUMPS AND BOOSTERS

WSW 15956-55

JOY

WORLD'S LARGEST MANUFACTURER OF VANEAXIAL-TYPE FANS

SAVES 50% ON CLEAN AIR MAINTENANCE COSTS!

THE FIRST TOTALLY NEW FILTER DEVELOPMENT . . . IN 25 YEARS

*This is not an idle claim . . . it's a fact . . . PROVEN UNDER ACTUAL INSTALLATION AND MAINTENANCE CONDITIONS.

Make no mistake about it . . . no matter *how small* your filter requirements . . . or *how large*, here is a completely new air filter development that can *absolutely cut your clean air maintenance costs in half.*

NO HEAVY TENSION OIL — Evans filters do not have a messy, sticky type of adhesive that is filthy to handle and difficult to clean. It is unnecessary and is forbidden in the use of Evans filters.

CLEAN WITH TAP WATER — Evans filters can be cleaned clean in minutes with nothing ever but tap water sprayed through an ordinary garden hose nozzle. They require no expensive fireproof room. No caustic cleaning solutions or agents. This eliminates all danger in the cleaning of Evans filters.

LIGHT WEIGHT CUT LABOR COSTS — Evans filters are all aluminum. Light to handle, to carry, to pick up. In spite of airtight fitting frames, Evans filters pull quickly and easily in and out of the frames. Take much less effort, less labor to handle. No latches . . . or lugs required.

REMEMBER: Initial costs for air cleaning equipment are not the big factors or controlling factors in the cost for clean air.

IT'S OPERATING COSTS THAT YOU MUST LIVE WITH AND THAT YOU MUST CONTROL.

EVANS FILTERS GIVE YOU THAT CONTROL. MAKE IT POSSIBLE FOR YOU TO SAVE 50% ON CLEAN AIR MAINTENANCE COSTS.

- ALL ALUMINUM
- EVERY PART PRECISION MADE
- HOLD UP TO 200% MORE DUST AND LINT WITHOUT HARMFUL RESTRICTION TO AIRFLOW
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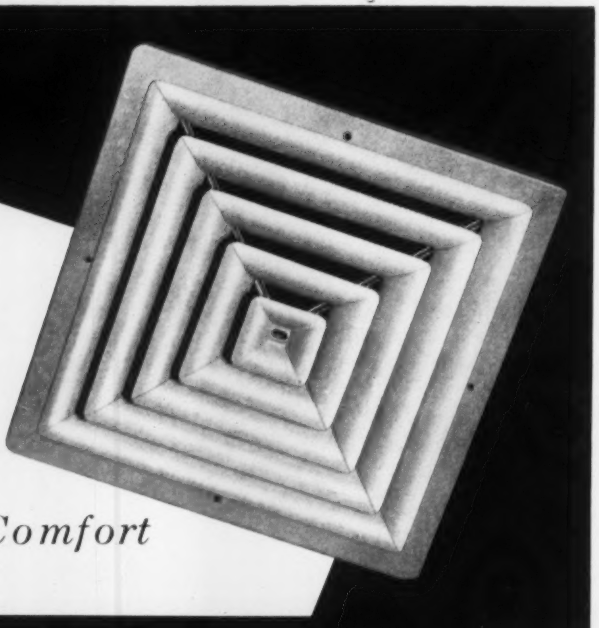
Lifelong **AIR FILTERS**

2 Beautiful Ways

to assure Draftless Comfort



Lima Series 60

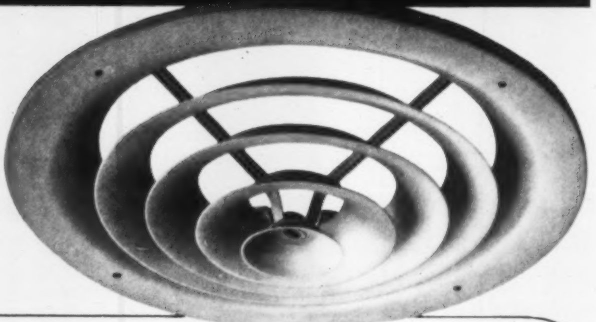
SQUARE STEP-DOWN CEILING DIFFUSER

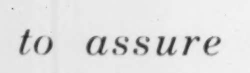
Matches the beauty and symmetry of modern square block ceilings for the finest commercial installations. Available in six sizes.

Lima Series 65

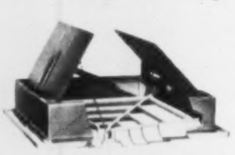
ROUND STEP-DOWN CEILING DIFFUSER

A new high in quality at a low unit cost, for economical commercial installations. Available in seven sizes.





Built-in spring-loaded butterfly dampers provide simple fingertip volume control and positive air shut-off. Lima "Balancing Bell" control feature for easier balancing.



Here's beauty that blends harmoniously with modern commercial interiors . . . and air handling performance that adds up to permanent satisfaction.

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Installation is easy and quick. Four screws hold diffuser and built-in damper assembly to pipe duct. Balancing is simplified with volume control right in the diffuser. The attractive light beige finish is permanent and harmonizes with modern ceilings.

Lima Ceiling Diffusers and Dampers offer many advantages as return air outlets and vents, eliminating large unsightly grilles.

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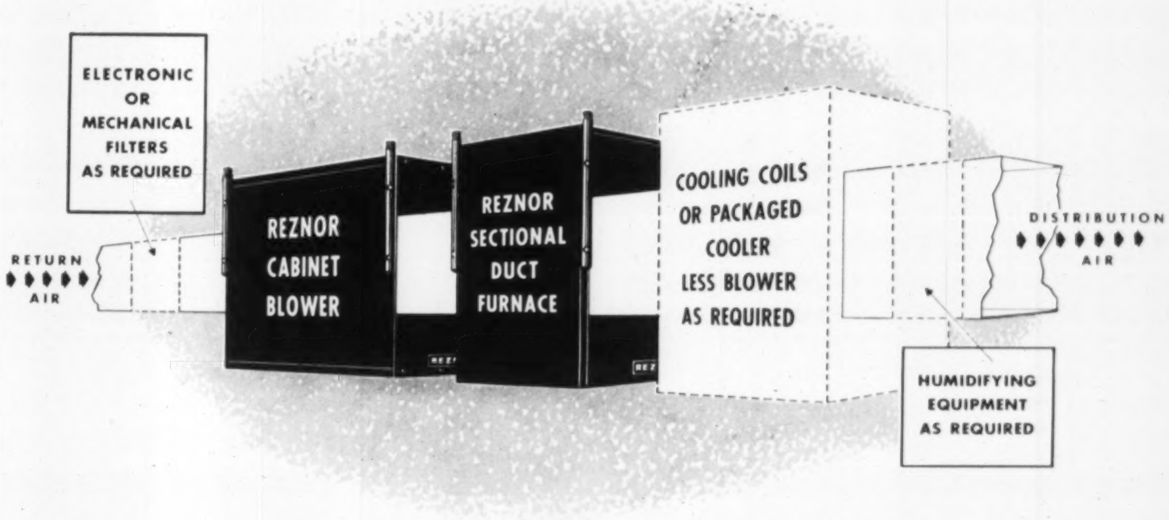
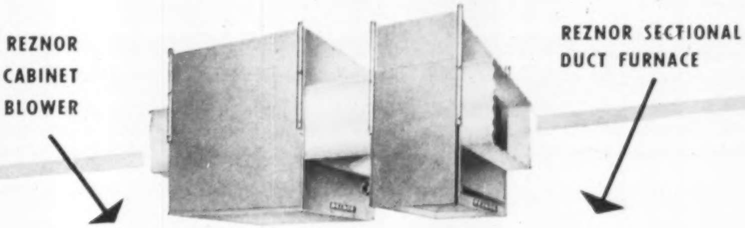

ELECTRONIC OR MECHANICAL FILTERS AS REQUIRED
RETURN AIR
REZNOR CABINET BLOWER
REZNOR SECTIONAL DUCT FURNACE
COOLING COILS OR PACKAGED COOLER LESS BLOWER AS REQUIRED
DISTRIBUTION AIR
HUMIDIFYING EQUIPMENT AS REQUIRED

You complete the picture by specifying additional components to meet *exact* job requirements


REZNOR CABINET BLOWER
REZNOR SECTIONAL DUCT FURNACE

- Four sizes—air deliveries range from 1000 to 8000 CFM
- Built-in filter racks
- Removable panels allow easy access to filters and drive
- Standard height on all duct flanges, matches that on furnaces, facilitates duct connections
- Each blower is exact match for one furnace section, as required for heating only
- Larger blower with by-pass duct easy to install where addition of cooling equipment necessitates large air deliveries

- Four sizes—150,000, 200,000, 250,000 and 300,000 BTU
- Sections may be installed side-by-side and in multiple banks to achieve system capacities of more than 2,500,000 BTU
- Maximum section weight of 315 pounds eliminates installation problems on large capacity systems
- Threaded mounting tubes interchangeable for suspended installation or base mounting
- For use with any type of gas

- Interchangeable snap-out plates for vertical or horizontal flue connections
- Built-in draft diverter is reversible so that flue connection may face in either direction
- Controls may be located on end or side as preferred
- Designed for air flow in either direction
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- Rugged steel construction . . . grey-green Perlite baked enamel finish

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HEATERS

REZNOR MANUFACTURING CO., 51 Union Street, Mercer, Pa.
Please send me bulletins giving complete specification information on Reznor sectional duct furnaces and cabinet blowers.

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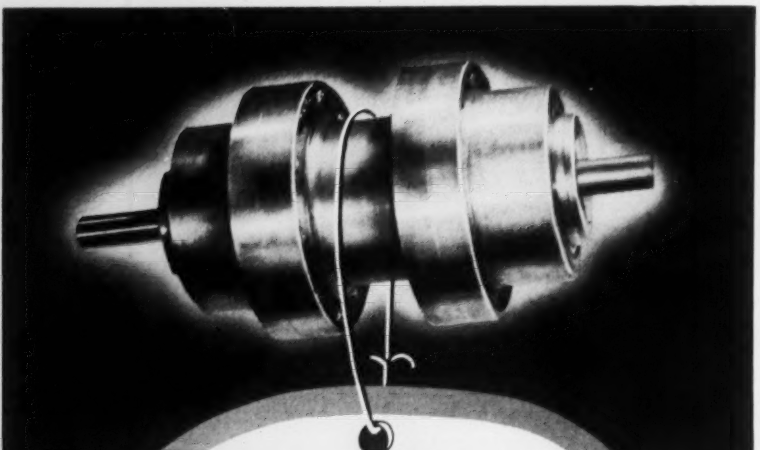

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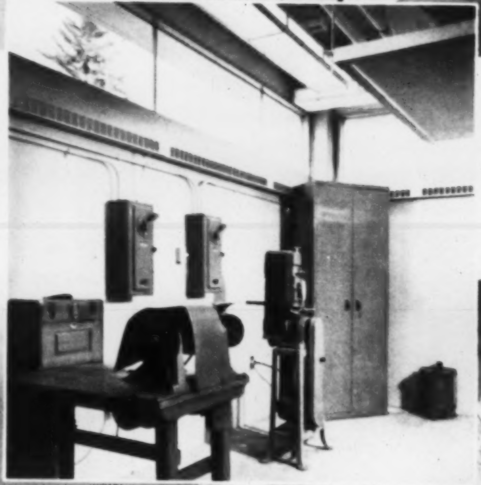

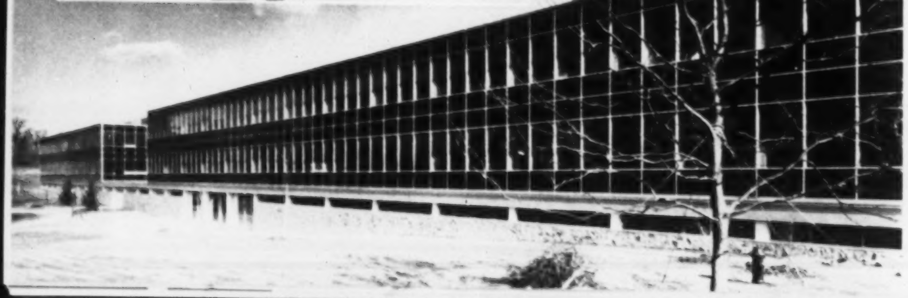

(Above) Main Lobby, Wyeth Laboratories, Radnor, Pa. Custom Walvector enclosure beneath transom window has grilled lower inlet and top outlet grille.

(Left) Machine Shop. Custom Walvector enclosure extends over edge of wall.

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New, completely air-conditioned headquarters of Wyeth Laboratories, heated by Custom Webster Walvector with forced hot water. Exterior walls are green-tinted glass with porcelainized steel paneling. Total building space, 170,000 sq. ft. Architect: Skidmore, Owings & Merrill, New York. Engineer: Seelye, Stevenson, Value & Knecht, New York. General Contractor: George A. Fuller Co., New York. Mechanical Contractor: W. M. Anderson Co., Philadelphia.

LQ600

NEW HIGH STANDARDS OF VALVE PERFORMANCE!

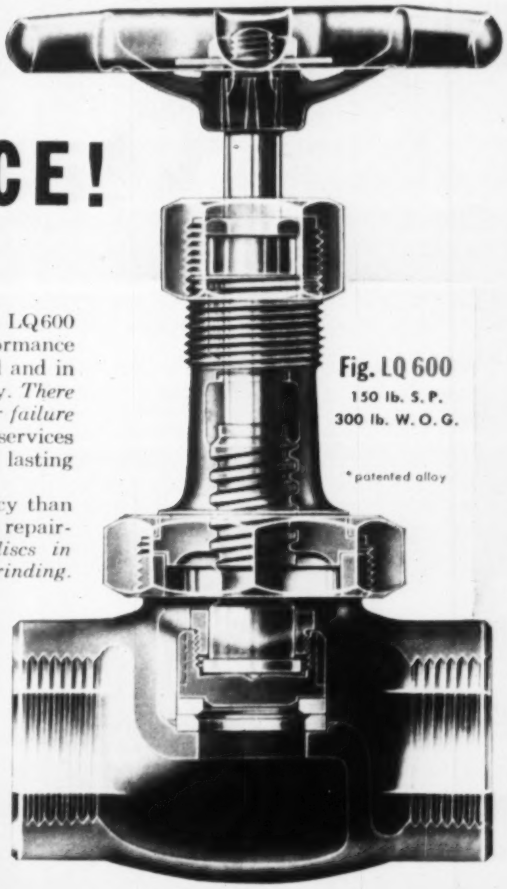

Fig. LQ 600
150 lb. S. P.
300 lb. W. O. G.

*patented alloy

Wherever bronze globe valves are used, LQ600 has been setting and breaking new performance records . . . in petroleum, paper, chemical and in power and industrial installations generally. *There has not been one reported case of leakage or failure* of an LQ600 Valve—even on "killer" services where the valves LQ600 replaced were lasting only two weeks to two months.

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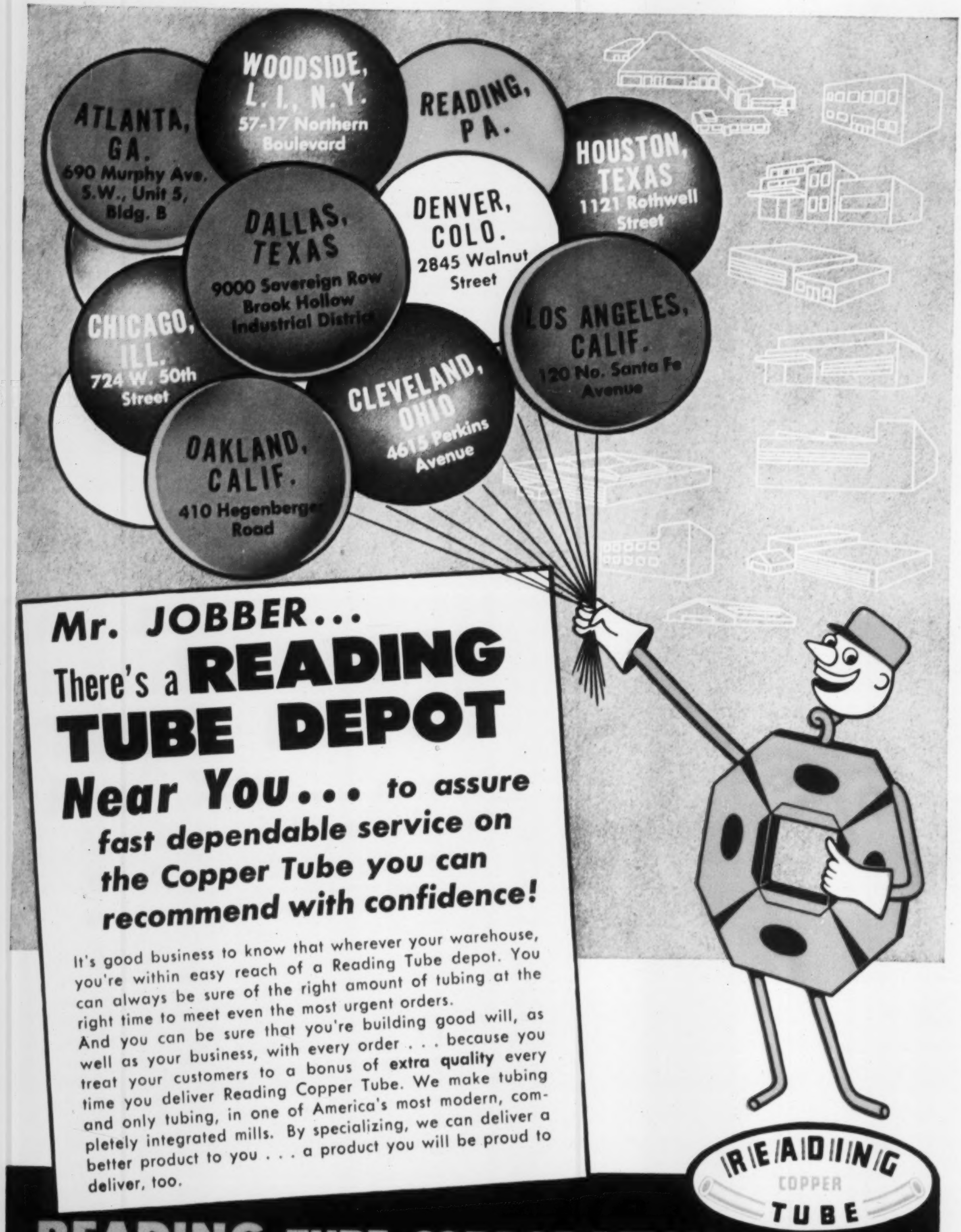
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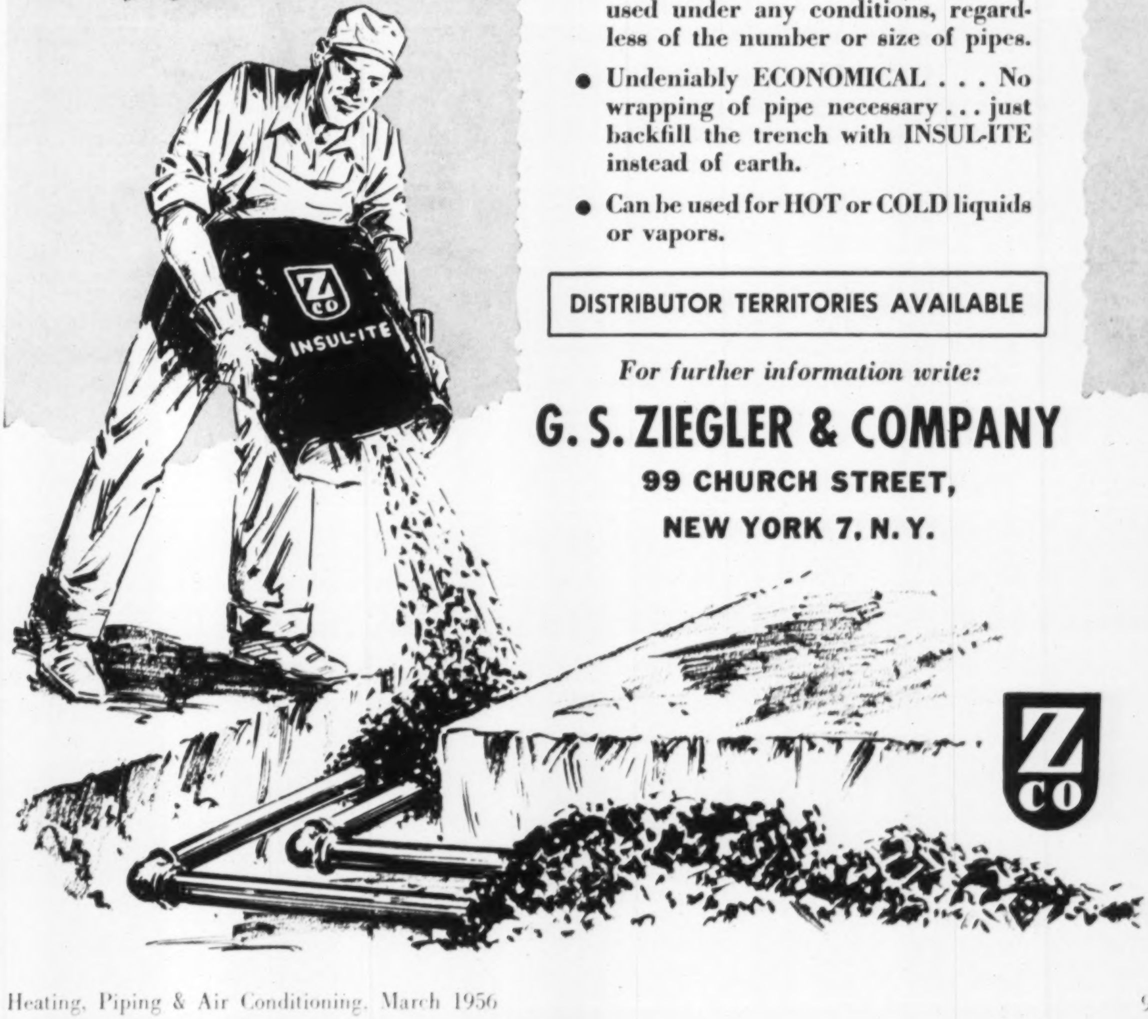
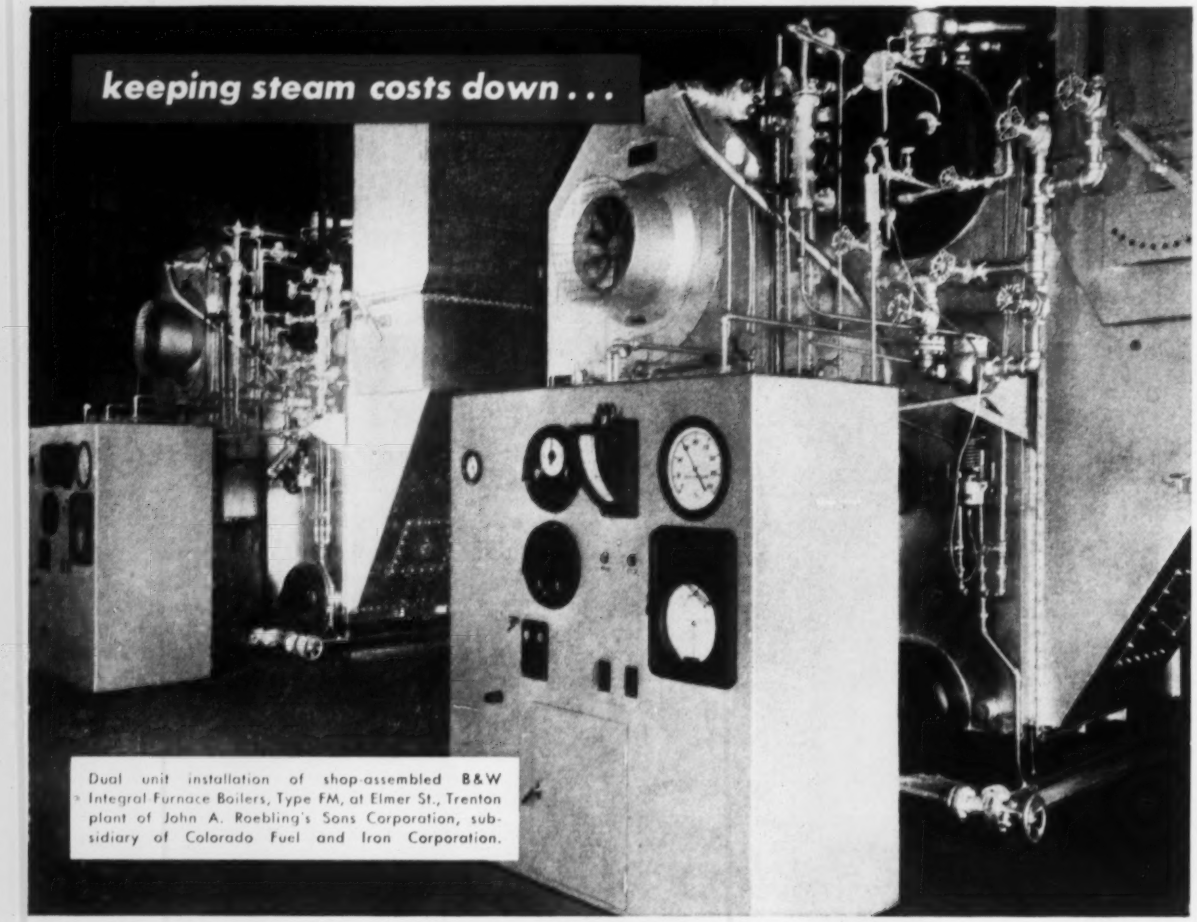




Dual unit installation of shop-assembled B&W Integral Furnace Boilers, Type FM, at Elmer St., Trenton plant of John A. Roebling's Sons Corporation, subsidiary of Colorado Fuel and Iron Corporation.

with Two More B&W FM Boilers

at ROEBLING

A subsidiary of The Colorado Fuel and Iron Corporation

When John A. Roebling's Sons chose two B&W Integral-Furnace Boilers, Type FM, for their Elmer Street Plant in Trenton, N. J., they acted with the assurance born of experience. Nearly two years before, a single FM boiler had been put in operation at the company's Buckthorn Plant and its economical operation, dependability and B&W service were decisive factors in the selection of the additional FM units, which have been in service since October 1953.

Each of these compact, automatically controlled B&W FM Boilers is oil-fired with a B&W Y-Jet oil burner and is designed to supply 28,000 lb of steam per hr at pressures of 235 psi. They combine the fuel saving, space saving, and other practical benefits of "package" steam with many of the cost-saving advantages inherent in big-boiler design, and the result is substantial overall economy.

Repeat orders for B&W Boilers are an old story at Roebling. Even before the first FM was installed, three B&W Integral-Furnace Boilers, Type FH, started the trend with performance that has, on the record, brought consistently large annual savings. And last year, Roebling placed two more FM units in service, a total of five in their various plants.

Like Roebling, many other companies including industrial plants, utilities, and other users have found the versatile, self-contained B&W FM Boiler most suitable for their steam requirements. Units having a total steam capacity of well over 11 million lb per hr are now in service or on order. The FM Boiler is available in standard sizes for loads to 40,000 lb per hr at steam pressures to 235 psi. Many are in operation at higher pressures and with moderate superheat. Write for Bulletin G-76C for a detailed description of this boiler. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

Consider these
COST SAVING FEATURES
in terms of your steam requirements

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Suitable for Outdoor Service
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

G-641

BABCOCK & WILCOX

BOILER DIVISION

The Editors' Pages

Construction Volume Keeps Soaring

. . . industrial, commercial, institutional, military and other building above last year

THE SOARING volume of construction activity which gave the industry its biggest year in history in 1955 will continue at least through the first half of 1956, according to a nationwide survey by The Associated General Contractors of America among its national directors and officials of its 124 chapters. Increases in building, highway, and heavy engineering activities were anticipated in a majority of the replies. Only about 10 percent of the respondents expect a decrease in their localities.

The survey was conducted in advance of the 37th annual convention of the AGC last month. The replies were in keeping with other forecasts for construction in 1956. The estimate prepared jointly by the Depts. of Commerce and Labor last November forecast a continued rise in new construction to $44 billion. The AGC in its outlook estimated that new construction might reach $44.5 billion, and maintenance and repair $15.5 billion, to give the nation its first $60 billion construction year. New construction in 1955 totaled $42.25 billion, and maintenance and repair work about $15, or a total of about $57 billion.

As to actual new construction put in place in January, the U.S. Depts. of Commerce and Labor reported a 1 percent increase over January 1955 to $2.85 billion. Industrial building continued the upward swing, which began in the last quarter of 1954, and set a new record for any month: $228 million. Commercial building, despite a seasonal decline of 7 percent, reached a new January high of $249 million, nearly one-third above a year ago. New January highs were also recorded, despite seasonal declines, for public schools, highways, and water projects. Compared with January a year ago, substantial increases were noted for military facilities and public service enterprises, reflecting a continuation of the higher levels prevailing during the latter half of 1955.

As to future construction, January awards in the 37 states east of the Rockies set a new high for the month: $1,858,228,000. This was 25 percent

Remember This Scene?

THIS SCENE from the award winning movie, "Marty," held a surprise for readers of HPAC. For the magazine on the table between the two actresses is none other than HPAC. Several observers have commented that it was somewhat unusual to see a technical journal where a popular consumer magazine would more likely be.

How did HPAC get into the movie and what was it doing in a scene with a mother and a mother-in-law? Hollywood isn't explaining. The prop man who was responsible for placing it in its position of prominence on top of several magazines has had a mental lapse about the whole thing.

The two ladies play Marty's mother and aunt. Marty was a butcher, and his cousin, Thomas — in whose living room this scene is set — was an insurance salesman. Possibly he sold property insurance in HPAC's field and was reading for background.

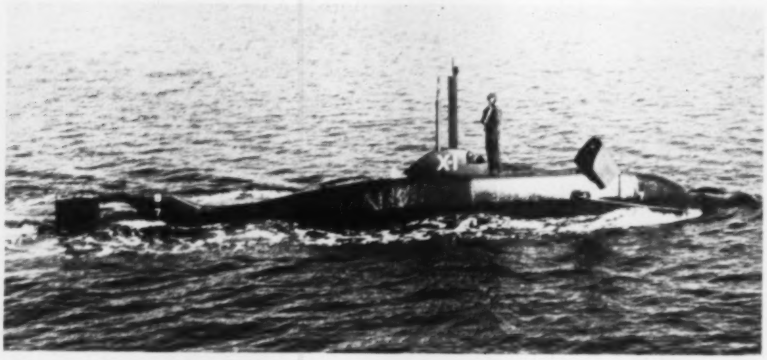
In no connection with HPAC's movie debut, the film was recently named best movie of 1955 by the New York Film Critics and the National Board of Review of Motion Pictures. It is also a leading candidate for moviedom's famed Oscar, awarded annually in March by the Academy of Motion Picture Arts and Sciences. ‡

ahead of the previous January record set last year, according to the F. W. Dodge Corp.

Awards for residential building totaled $691,392,000, reversing a declining tendency which appeared late in 1955 and rising to a new record, 3 percent above that of January 1955. This marks the fourth successive year in which new January residential records have been set.

Awards for nonresidential building also set a new record of $661,275,000, 17 percent ahead of January 1955. The increase was accounted for by rises in contracts for industrial, educational, and institutional buildings, with other nonresidential categories showing declines.

Heavy engineering contracts showed the greatest percentage increase. The total of $502,561,000 for public works and public utilities was a new record, up 102 percent over the previous January. This must be appraised in the light of the fact that there were several unusually large projects in a few states. ‡



Navy Air Conditions New Midget Submarine

A 1 TON AIR CONDITIONER occupying a space only a little greater than would be required for a 50 gal oil drum air conditions the U. S. Navy's new midget submarine X-1, according to the Carrier Corp.

Cooling and heating coils, made with copper fins and tubes as a precaution against corrosion, are installed directly in the ducts.

The tiny sub weighs 25 tons, is 50 ft long, has a maximum diameter of 7 ft, and is manned by a crew of four.

Air conditioning has been shown by Navy tests to be of significant value in raising combat efficiency in all types of ships; it is considered especially important in the "mini-sub." ‡

Chemical Plant Gets Low Cost Air Conditioning

. . . by using water otherwise wasted

YEAR 'ROUND air conditioning at a low cost is being utilized in the offices of Cowles Chemical Co.'s new building at Skaneateles Falls, N. Y., according to the Trane Co. Cowles' engineers discovered that cold well water used in the production of an alkaline cleaner could be used for warm weather cooling before it was used as a cooling medium in one of the production processes.

The product is made in special furnaces, parts of which require cooling while ingredients are fused to produce the cleaner. Cooling is accomplished by pumping 50 F water from a deep well into the furnace cooling system. This water, which is heated to about 120 F in the process, was formerly wasted.

Now the 50 F water is used as a source of summer cooling in the offices, before it passes through the furnace system. In the winter, the 120 F water leaving the furnace is used to heat the offices. The water is sent to air handling units which serve most of the large office areas in the building, while individually controlled units supply year 'round air conditioning to other parts of the building. ‡

"Quote"

"Horsepower and refrigeration tonnage are typical 'folklore' units reflecting times when power was estimated in terms of animals as prime movers and refrigeration in ice from frozen rivers. Each is a monument to man's past inability to measure accurately or recognize the identity of different manifestations of the same thing: energy in action!"—*F. W. Hutchinson, University of California, in Refrigerating Engineering, June 1955.*

Air Conditioning Cuts Office Cleaning Need

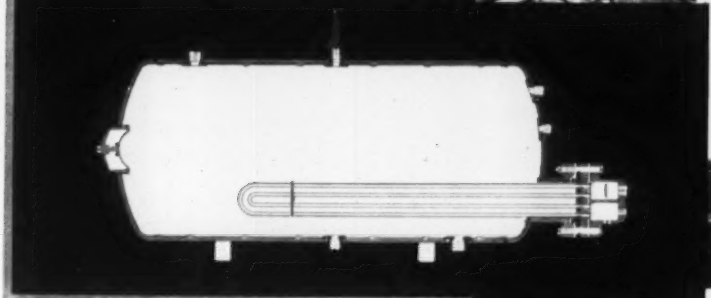
. . . savings up to one-half seen

AIR CONDITIONING materially reduces the need for cleaning buildings, according to W. J. McLaughlin, editor and business manager of Skyscraper Management, writing in a recent issue of that magazine.

With air conditioning, he suggests, a good share of routine cleaning can be eliminated by cleaning only every other night. This could be an important economy since cleaning is the highest operating cost in the office building industry. We now spend $202 million a year for cleaning, he says.

Mr. McLaughlin raises the question, "Are we overcleaning?," pointing out that regardless of cleaning methods and programs tried, the average cost of cleaning operations continues to mount. ‡

Dallas: Republic National Bank Building. *Architects:* Harrison & Abramovitz; Gill & Harrell. *General Contractor:* J. W. Bateson Company, Inc. *Consulting Engineers:* Jaros, Baum & Bolles. *Mech. Contractor:* Farwell Company, Inc.



Denver: Mile High Center. *Architects:* I. M. Pei and Associates. *Associated Architect:* G. Meredith Musick. *Contractor:* George A. Fuller Company. *Consulting Engineers:* Jaros, Baum & Bolles. *Mechanical Contractor:* Kerby Saunders, Inc.

New York: Lever House. *Architects:* Skidmore, Owings & Merrill. *Contractor:* George A. Fuller Company. *Consulting Engineers:* Jaros, Baum & Bolles. *Mechanical Contractor:* Kerby Saunders, Inc. *Plumbing Contractor:* Gillman-Rous-Pesce Corp.

FOR TROUBLE-FREE, GUARANTEED PERFORMANCE

THEY SPECIFIED P-K *Copper-Lined* HEATERS

These three famous new buildings are at different points of the compass . . . yet they have one thing in common. When it came time to specify storage heaters, they selected P-K. And though they're far separated in miles, these P-K copper-lined heater installations aren't as isolated as they look. A list of famous buildings all over the country using P-K copper-lined heaters is an honor roll of American business.

Why are P-K copper-lined heaters specified for America's finest buildings? For one thing, experienced engineers know the value of having one supplier who carefully makes and assembles (and is responsible for) every component of the heater.

But more important, engineers know that when it comes to vital points of construction, P-K is miles ahead. For example, P-K copper-lined heaters have rolled joints every 12 inches around the full circumference, to allow for longitudinal expansion . . . heavy flanged copper silicon couplings, welded to both the shell and the lining . . . and a special P-K vacuum breaker to protect the lining from sudden pressure fluctuation. Separate hydrostatic and pneumatic tests are made to guarantee leak-proof linings.

There are other points, too, not found in so-called "economy" heaters, that should be specified for any heater you buy. All these critical construction features have been detailed in a fabricating procedure file which we have prepared on copper-lined heaters. We think you will find it helpful. Write today for P-K file 18A.

The Patterson-Kelley Company, 730 Burson Street, East Stroudsburg, Pa.

PATTERSON P KELLEY

storage water heaters • instantaneous heaters • converters • fuel oil heaters • freon chillers and condensers

installing nesbitt sill-line...

easy as

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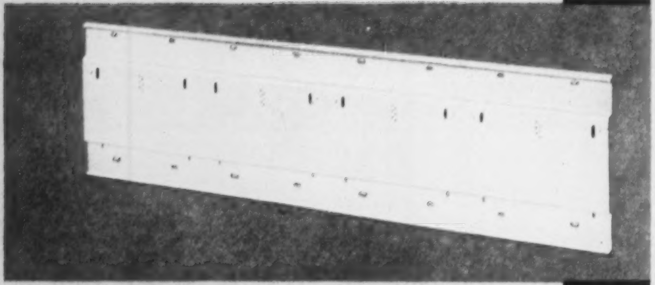
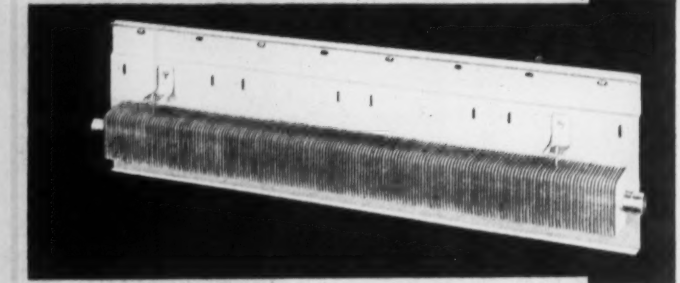


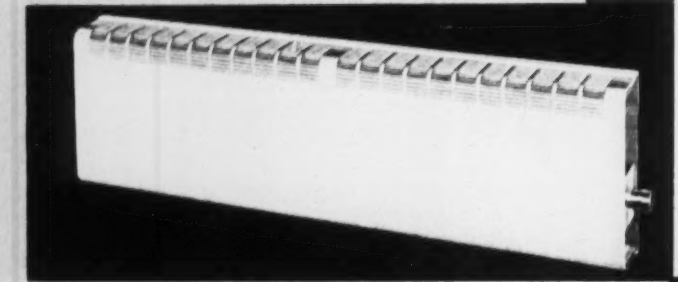
Erect the back panel. It is one true and rigid piece, formed of 20-gauge steel. It fastens to the wall or studding with a few screws and alines perfectly when butted to other sections. With seven lengths — 2 to 8 ft. — and sleeves, you may fit any wall to wall without cutting.

2



Suspend the heating element. There are eight types, with corrugated aluminum fins, offering a wide range of capacities, steam or hot water. The copper tube ends are sized-to-mate for easy sweat jointing, and the adjustable hanger brackets provide for pitch and expansion.

3



Mount the front enclosure. The die-formed 16-gauge front locks into back panel for full length support at top and bottom. Other accessories are added. One, two, three — and the world's most beautiful perimeter radiation is ready to bring comfort with economy to modern interiors.

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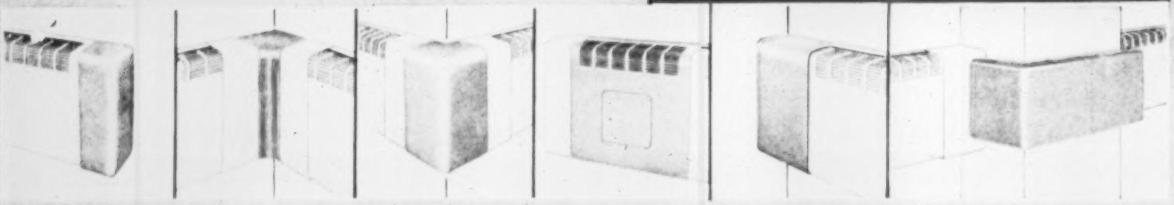

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"Open for Discussion"

• *WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

Can Air Curtain Stop 40 Mph Wind?

. . . we don't believe it, readers say. Here are the highlights of comments the article has received and a selected letter which admits it's technically possible to design an air curtain to stop a 40 mph wind. In reply the author states that the Cincinnati installation was designed for mild winds, as the article points out. In addition, he cites a 38 ft wide Swiss installation which takes care of not only a northwest wind but stack effect of 1 in. WG also. Further, he explains various design considerations of other installations being planned or installed.

MANY READERS have questioned the validity of the design conditions of the air curtain installation reported in the article, *Air Curtain Seals a Door Opening*, by Edward E. Gygax in the January HPAC. The point that has been seriously questioned is that design is based on stopping a 40 mph wind and neutralizing the building's internal-external pressure differential. Readers have asked how the one installation mentioned has successfully neutralized an external pressure of 1 in. water gage.

While in Cincinnati, the Editor visited the supermarket in which the air curtain door was installed and mentioned in Mr. Gygax's article. Talking with store personnel, he found that the air curtain required careful adjustment to keep the checking areas from being too cold when the outdoor temperature was 30 F or lower.

In view of the wide critical interest this article and this method have stimulated, HPAC publishes here a representative letter from one reader and the author's reply.

Practical Design Limit Is 15 Mph Wind For Commercial Establishments

AS WE HAVE designed and installed many air curtains in numerous countries over the past few years, we were very much interested in the article, *Air Curtain Seals a Door Opening*, by Edward E. Gygax, in the January HPAC. In principle we agree with the explanations given in the article. However, while from a technical standpoint it is possible to design an air curtain stopping a 40 mph headwind, ductwork, filters, and fans then reach such large dimensions that it becomes difficult to find the required space for their installation, and costs become prohibitive.

Furthermore, the air velocities in the outlet nozzles — which depend on the laws of physics and not on individual manufacturers' designs — would become so high as to be unacceptable for retail business installations designed for the general public.

According to our own experience, the practical design limit in installations for commercial establishments is a headwind of 15 mph. Winds of higher velocity can be stopped only in industrial installations, where the moderate discomfort of strong downdrafts is not objectionable.

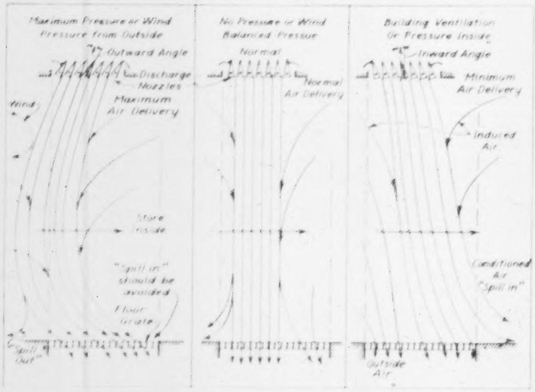
We wish to bring these remarks to the attention of those interested in air curtains in order to spare them possible disappointment once their new units are in service.

NORBERT ZEHNDER
Chief Engineer, Air Curtain Div.,
Sulzer Bros. Ltd., New York

THE AUTHOR'S REPLY—We would like to acknowledge the many comments we have received regarding my article, *Air Curtain Seals a Door Opening*, in the January HPAC.

The installation in the Cincinnati suburban supermarket, as the article states, was designed for mild winds. During the convention of the American Society of Heating and Air-Conditioning Engineers in Cincinnati, something was out of order on the nozzle adjustment, with only half of the nozzles directed against the wind. We took immediate steps to have this difficulty corrected. This chain is so pleased with their air curtain door that plans for several new stores and warehouses are under consideration.

A similar installation being made in New York City will have automatic nozzle and air volume control. Nozzle depth is being doubled. The depth of nozzle and the kinetic energy of air determines the amount of pressure that the curtain of air will withstand. With adjustable air discharge nozzles, practical commercial


Maximum Pressure or Wind Pressure from Outside
Outward Angle
Discharge Nozzles
Maximum Air Delivery
Wind
Store Inside
"Spill in" should be avoided
Floor Grate
"Spill Out"
No Pressure or Wind Balanced Pressure
Normal
Normal Air Delivery
Building Ventilation Or Pressure Inside
Inward Angle
Minimum Air Delivery
Induced Air
Conditioned Air "Spill in"
Outside Air

AIR CURTAIN'S DISCHARGE NOZZLES are directional so that the curtain can more effectively counteract wind pressures or take in outside air when desired for building ventilation, or permit normal vertical air delivery

installations have effectively stopped winds considerably over 15 mph.

One Swiss installation has a 38 ft wide door facing northwest. Here not only wind but stack effect of 1 in. WG is resisted.

We have found that many store owners are concerned with operating costs. We have been contacted by insurance companies and have found that door accidents amount to many times what operating costs are.

Industrial air curtain doors are being installed for an auto assembly plant in Robertson, Mo., and will be used as drive-out doors. Each opening is 12 ft wide by 8 ft high, and a deep nozzle field is used here. This is a northern exposure and has approximately a $1\frac{1}{4}$ in. WG internal pressure caused by many building exhaust fans.

Edward E. Gygax
Engineer
American Air Curtain Corp.

Three Main Factors Contribute Largely to Overheated Rooms

The article, *Why Are Many Classrooms Overheated?*, in the January HPAC is very well presented, and the reasons explained by the author apply in many instances to other types of buildings as well as to schools.

Three factors contribute largely to the overheated rooms described by Mr. Fuller. (1) Gross rather than net heat loss is used as the basis for calculating building heat requirements in the ASHAE Guide Chapter entitled "Estimating Fuel Consumption for Space Heating." (2) Conditions upon which use of the 65 F degree day base depends for accuracy have not yet been established. (3) Net heat requirements with outside temperatures at all levels above design temperature frequently are not considered in the planning of heating and ventilating systems, possibly due to the influence of the above two.

R. A. Parsons
Board of Water and Electric Light Commissioners
Lansing, Mich.

Receiver for Each of 11 Compressors Held Unnecessary; Use a Few Large Tanks

The comments regarding grouping air compressors by C. W. Gibbs in the December 1955 HPAC regarding my answer to the question, *How Can We Group Air Compressors?*, in the October 1955 HPAC require some additional thought, I believe.

Mr. Gibbs says, "The minimum air pressure that should be considered satisfactory at the point of use is about 90 psig."

Since the reader who asked the original question did not indicate the service, I question if this value should be considered when answering the question. Mr. Gibbs states the 11 units require 3200 hp. Again, not knowing the pressure, it is not possible to determine power requirements.

For his suggestions summarized at the end, Mr. Gibbs recommends procedures which generally agree with those given in my comments in the October 1955 HPAC. However, use of a receiver for each compressor of an 11 unit installation is not justified except for special applications. A few large tanks arranged in the manner explained in my answer will provide an economical arrangement, giving reliability and flexibility, in my opinion.

H. B. Wayne
Consulting Engineer

School Warm Air Panel-Convection System Has Many Plus Features

Regarding my article, *Slab-on-Grade Schools Heated by Warm Air Panels and Convection*, in the May 1955 HPAC, R. G. Vanderweil raises some interesting questions in his comments in the January HPAC.

It has never been my intention to hold that forced warm air heating is the only method, or the best from every consideration, for certain types of structures. However, we have found that variations of forced warm air heating, when properly integrated with the building structure, can provide a system with relatively low first cost, low operating and maintenance cost, and with many "plus" comfort producing features in addition to even heating, such as ventilation, cooling, humidification, and air cleaning. In answer to Mr. Vanderweil's questions, the following facts about forced warm air heating should be understood.

Controls are provided to permit outdoor air quantities to be controlled by outdoor temperatures. This allows the system to be operated in a manner so that when it is 60 F outdoors, 100 percent outdoor air may be brought into the building. When it is −10 F outdoors, the minimum amount of outdoor air consistent with the state codes is introduced. I believe it is agreed that in mild weather it is very desirable — considering comfort and health — to introduce large quantities of outdoor air. However, there is a simple additional control provided so that the maximum amount of outdoor air can be reduced, where desired, to sacrifice optimum room condition in favor of fuel savings. But our experience has shown that because of the low operating cost of air systems, more money can be spent to provide additional outdoor air if desired.

The forced warm air system does provide for individual room control, so that when cooling is required in occupied rooms or rooms with sunny exposures, it is possible to cool these rooms while providing heat for any rooms on the shady side of the building. In effect, the room thermostat does control the quantity of outdoor air to each classroom, since with some systems, outdoor air can bypass the furnace and be delivered directly to the classrooms.

Another advantage of the warm air system is that large quantities of outdoor air can be delivered to classrooms requiring cooling.

While it is true that recirculated air from various classrooms does mix in a central plenum, a germicidal treatment of the air is possible. The question of mixing the air from various rooms is academic, however, since all pupils at one time or another come in close contact with one another in the corridors, gymnasiums, auditorium, cafeterias, multipurpose rooms and, of course, in the classrooms themselves. This is true with schools heated by all methods.

The humidification provided in a forced warm air system is generally believed to be of great value in reducing the incidence of respiratory illnesses which are transmitted in fully occupied areas.

Forced warm air panel heating does not necessarily provide completely warm floors in all areas unless the intent to heat the floors is recognized in the design of the system. It is possible to heat the floors to 70 to 74 F by spacing the warm air ducts on 16 in. centers. This is usually done in the kindergartens and lower elementary grades. If this is done, the system is a true panel heating system. However, in our experience, it has not been necessary to provide complete panel heating plenums in the upper grades and in secondary schools.

Floor temperature can be controlled at a lower temperature than 70 to 74 F by spacing the ductwork on wider centers as desired. Nonetheless, when the ducts do run in the concrete slab, whatever heat is given to the slab is of use in helping maintain warm floors.

While the warm air system is not represented to be a true panel heating system in every case, it can probably be classified as panel heating if the semantics are important. Actually, the system does concentrate the greatest heat output near the large glass areas because the panel-convection heating system in all cases in our design provides forced warm air in front of the exterior glass walls, either in a counter top diffuser or in a diffuser in a stool the full length of the glass walls. Warm air, after passing through the floor and partially heating the slab, is then introduced directly into the room and provides a comfortable layer of warm air in front of the glass. I do not feel it is necessary to have a warmer floor temperature at the outside wall since we are not depending on floor temperature alone to heat the room.

The use of round fiber tube ducts has generally resulted in freedom from difficulty when properly inspected and installed. Some difficulties have been encountered because of poor workmanship or defective material. Fiber ducts are not the only type of material used with the forced warm air system. Recent jobs have indicated that galvanized sheet metal coated with an asphalt paint is an economical material, which will not require maintenance nor fail when used in concrete slabs.

The design of the forced warm air system must take into account the length of run from the most remote classroom to the heater room. The more distant classrooms are provided with more air than the nearer classrooms in order to accomplish control and an equal "heatup cycle." In large schools of 65,000 to 70,000 sq ft, it has been found that the difference in "heatup" time in remote classrooms and near classrooms has been small.

In very large schools, of course, the warm air heating can be accomplished by a split system so that air handling units are located in areas farther from the boiler room to handle a group of rooms in close proximity to the air handling units. In those systems, heat is supplied by means of water or steam to the air handling units. The duct distribution system in these cases becomes very small, and all classrooms are easily controlled to maintain the same condition. The split system, of course, is differentiated from the direct fired heating system. Each has its proper place, depending on the architectural layout of the plant. Since practically all auditoriums, gymnasiums, and other large areas are heated with air by some means, the idea of a split system is not new or startling.

In the school mentioned in the original article, where about $18,000 was saved in first costs, this amount represents a saving between the contract price for the air system of $38,200 compared to the estimated cost of another system for $56,000.

Many factors led to the adoption of a warm air system using three separate furnaces. Since the site had a rather high water table, it was decided that there should be no heating pipes or ducts in the ground between buildings. Important in the low cost of the heating system were the complete integration of the heating system with the structure, the very short distribution systems within the buildings, and the close cooperation of the architect and the engineer in designing the building to accomplish economies. The additional cost for structural provisions to accommodate the heating system was very small.

My article was in error in stating that there was a simultaneous fuel savings of 15 to 35 percent, since this particular school was not in operation at the time that this article was written.

While fuel cost is a very controversial subject — and one in which it is difficult to prove the superiority of one system over another — I feel that a direct fired, forced warm air system is more economical to operate. This is based on my 15 years of experience with more than 5000 heating plants of all types, both in my capacity as a consulting engineer and as an engineering contractor.

Some buildings, however, are not adaptable to warm air systems and there should be no attempt to install such a system.

The use of a heat exchanger in a warm air system to heat the incoming outdoor air by recovering the heat in the warm air expelled through the exhaust ventilation system is a new idea, as far as we know. Initial cost of heat exchangers that we have designed can be recovered in fuel savings in about eight years.

The article, *Slab-on-Grade Schools Heated by Warm Air Panels and Convection*, was not meant to be a treatise on school heating plants but the report of one particular solution in one particular school. The same type of system can be used in similar schools, with modifications as necessary. The article itself indicated that it was a warm air panel and convection system and not simply a panel heating system.

FRED S. DUBIN
Consulting Engineer

Ramps with Snow Melting Use Steel and Wrought Iron in Two Installations

THE HIGHWAY RAMP with snow melting shown in the photo on page 168 of the January HPAC serves the Port Authority bus terminal in New York, not the Boston aerial highway which the caption describes. HPAC regrets this inadvertent slip, the result of switching photos but not captions.

Source credit for the photo used was correctly given to the Committee on Steel Pipe Research, American Iron and Steel Institute. Steel pipe is used in the New York bus terminal installation. Wrought iron pipe is used in the Boston highway, which was described and illustrated in a three-page article in the May 1954 HPAC. ‡

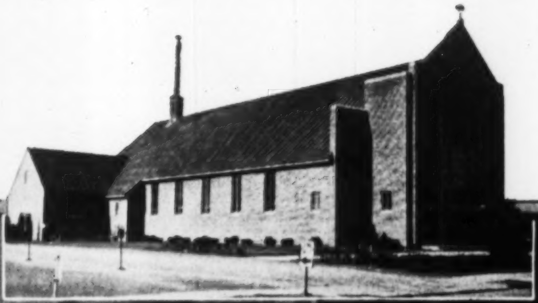
Air Conditioned Tucson Cathedral Beats 106 F Heat

THE NEWLY AIR CONDITIONED San Agustin cathedral was built at the turn of the present century. Its thick walls and high ceilings were designed to temper the Arizona heat as much as possible. Nevertheless, toward the end of the long Southwestern summer, temperatures inside any building tend to approximate those outside.

There was no ductwork. The building had previously been heated by four floor furnaces, and had been cooled sketchily in summer by electric fans. Return air passages replaced the floor furnaces. Up under each pew, right against its center support, a 3 in. round pipe was installed from an air supply chamber. Each of these pipes conducts air into a metal box nearly as long as the pew, from which it flows out through $\frac{1}{2}$ in. holes. There are 10 supply pipes in the sanctuary, and two air handling units in the choir loft, according to Servel, Inc.

In a small adjacent building two gas fired steam boilers, two 25 ton water chillers, two condensate pumps and a circulating pump are installed. The chilled water is conveyed into coils in the 12 supply chambers inside the cathedral, and air is blown over the coils and then distributed throughout the cathedral.

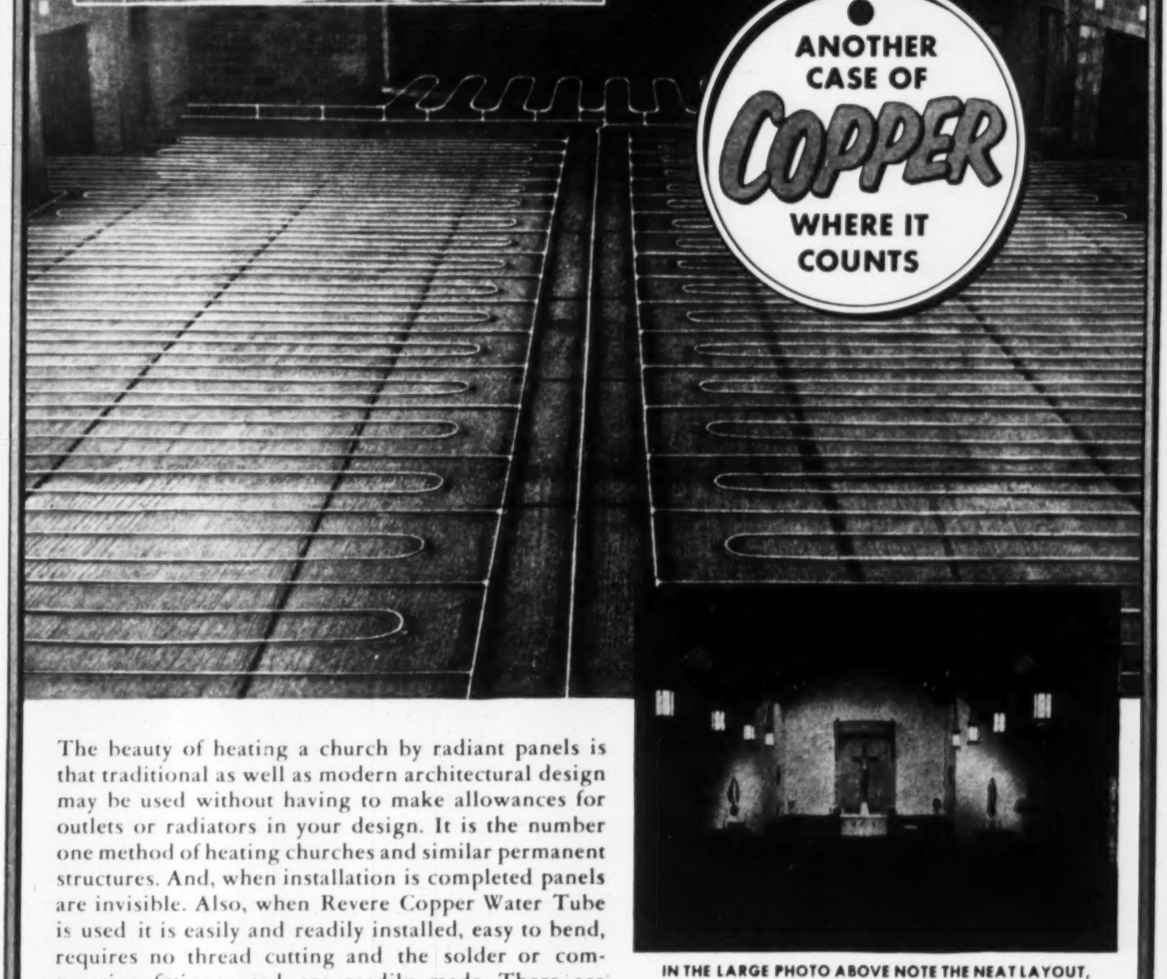
The first day there was an outside temperature of nearly 100 F. Mass at 7 a. m. drew 600 worshippers and raised the temperature slightly. A second service at 8 a. m. with 1000 present found the temperature 102 F outside and 77 F inside. At 9 a.m. 1200 persons — full capacity — were present for a special service, which lasted until noon. The 9 a.m. temperatures had been the same as at 8 — 102 F outside and 77 F inside. At noon the readings were 106 F outside and 81 F inside. ‡



St. John The Baptist Church

Rome, N. Y.

***Architect:* FRANK W. BRODRICK, Syracuse, N. Y.**
***Engineer:* MALCOLM B. MOYER, Syracuse, N. Y.**
***Gen. Cont.:* JAMES PAOLINI CONST. CO., INC., Syracuse, N. Y.**
***Heat Cont.:* O'SHEA SUPPLY CO., INC., Rome, N. Y.**



The beauty of heating a church by radiant panels is that traditional as well as modern architectural design may be used without having to make allowances for outlets or radiators in your design. It is the number one method of heating churches and similar permanent structures. And, when installation is completed panels are invisible. Also, when Revere Copper Water Tube is used it is easily and readily installed, easy to bend, requires no thread cutting and the solder or compression fittings used are readily made. There are fewer of these fittings and they are tight, trouble-free fittings when finished.

A radiant panel heating system of Revere Copper Tube is a long-lasting one, too, which is mighty important in a permanent structure such as a church. For copper tube cannot rust, its endurance has been proved for centuries.

So never mind what the other fellow says . . . *you* keep out of trouble with copper. Use Revere Copper Water Tube for radiant panel heating, hot and cold water lines, underground service lines, processing lines, waste stack and vent lines. Your Revere Distributor has plenty of stock these days, in all the required sizes.

IN THE LARGE PHOTO ABOVE NOTE THE NEAT LAYOUT, the even, easily-bent lengths of Revere Copper Water Tube, the few number of fittings . . . only every 60′ in the panels. 5,000 ft. of tube was used in sizes ranging from ¾″ to 1½″. The architect and contractor tell us that the suggestions made by one of Revere's Technical Advisors were most helpful in both the planning and installation stages. Why don't you take advantage of this service? No obligation, naturally.

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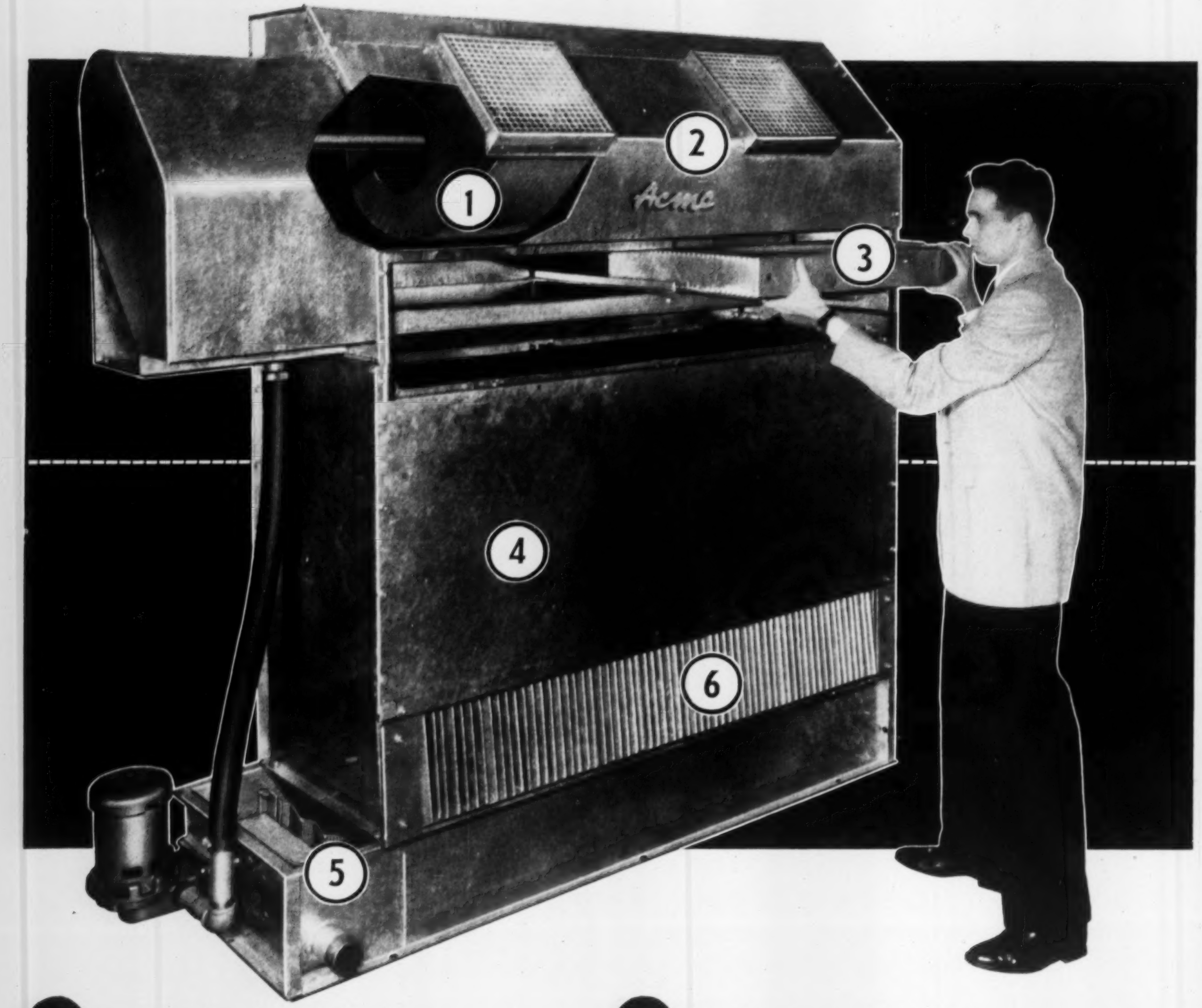

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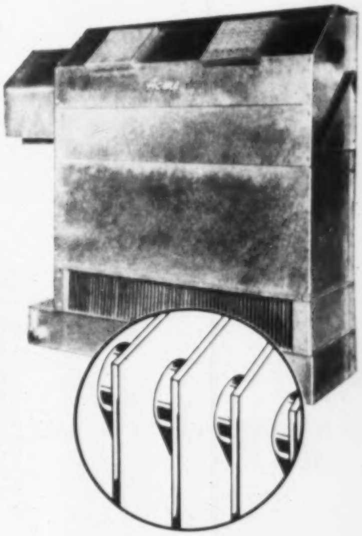

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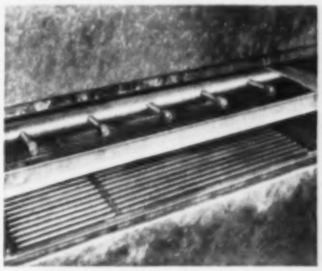

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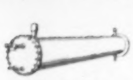

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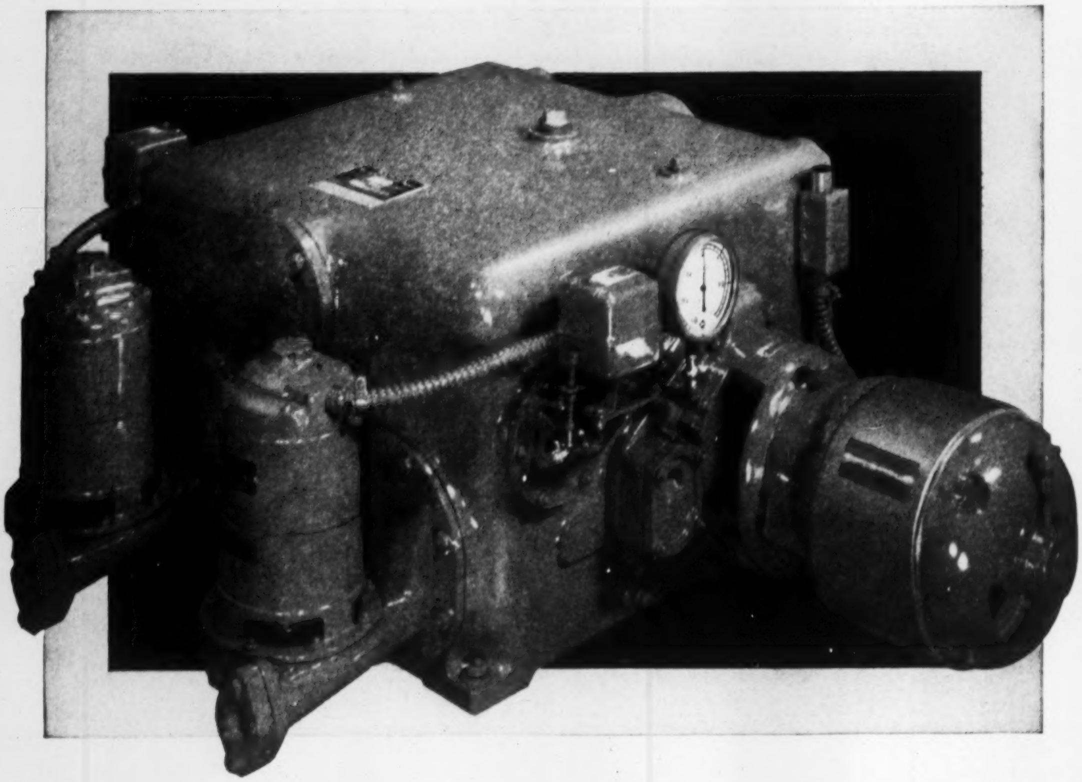

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These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low, returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- ✓ **Increased air capacity induces rapid system response without wasteful overheating.**
- ✓ **Separate air and water pumps individually selected to meet actual job requirements.**
- ✓ **Control system that operates individual pumps only when needed.**
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- ✓ **Low, low, return line connection.**

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How Much Does Air Conditioning Raise Operating Costs In an Office Building?

After eight years of operation, here is the analysis of "extra" operating costs for air conditioning a typical high grade commercial office building. Cost breakdowns exclusively for operating the 1000 ton system total $33,789 per year. This includes labor, purchased steam, electricity, and water, water treatment, and repairs. The cost equals 13.1 cents per sq ft, or $34 per ton of installed refrigeration.

AIR CONDITIONED nine years ago, the Universal Pictures building was the first large office building with full air conditioning to be built in New York after the war

By Lewis Smith

Heating Engineer

WHAT does air conditioning add to the cost of operating an office building? Or to put it in another way, since a building has to be heated anyway, what is the extra cost of cooling it in summer?

Here is the answer for a typical high grade commercial office building in New York City. This building has separate heating and cooling systems, with adequate metering of both. Steam, electricity, and water are purchased, so that with the meters installed there is no estimating to be done. It has been in operation for eight years.

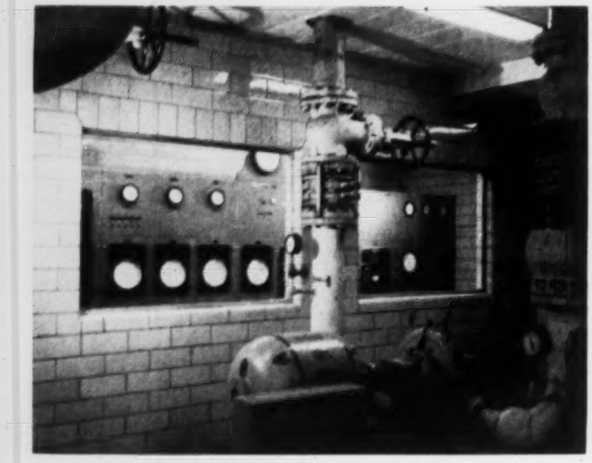
Located at 445 Park Ave., the Universal Pictures building is 22 stories high. It is owned by Tishman Realty and Construction Co. The building is 200 ft, 10 in. long on Park Ave., and 90 ft deep on the side streets. It rises 11 floors at these dimensions, and then there are 11 more floors with increasing setbacks, and above that the elevator machinery and cooling tower. The rentable area calculated under the formula of the New York City Real Estate Board is 258,000 sq ft, including fan rooms and toilets. The cube of the building above grade is 3,354,000 cu ft.

There is a complete heating system with a convector under every other window, totalling 27,000 sq ft EDR, for the offices, with three zones of automatic temperature control by means of a subatmospheric steam system. A separate zone with about 4000 sq ft EDR for the stores on the ground floor has individual control. Steam is purchased from the New York Steam Corp., and steam for the heating system is separately metered.

Cool Five Zones On Each Floor

The cooling system, which also serves as the ventilating system in winter, includes a fan on each floor capable of supplying about six air changes per hour, with provision for admitting 100 percent outside air. There are the usual steam coils for tempering the primary air in winter and cooling and reheat coils for summer use.

Distribution ducts in the hung ceilings are arranged in five zones



INSTRUMENT PANEL, visible through plate glass windows of machine room, is in an air conditioned room. Meters for steam, electricity, and water accurately record these air conditioning costs

560 HP STEAM TURBINE drives 500 ton centrifugal compressor, out of sight at left. Steam for air conditioning, metered separately from that for heating, is 6.5 million lb per year, costing approximately $5400 for the 1000 ton system

on all but a few top floors, where the area is much smaller. On a typical floor the duct to the west exterior spaces contains a cooling booster coil, this being the hottest exposure. A second zone takes care of the north exterior spaces; and a third zone supplies the similar south spaces, each of these ducts having a steam booster heating coil. The purpose of these extra duct coils is to permit adequate cooling of the west side spaces without overcooling the others. Two smaller duct systems take care of the interior spaces.

For supplying the chilled water, there are two 500 ton centrifugal compressors in the basement, each driven by a 560 hp steam turbine at 150 psi. The units can be run at 5100 rpm, but the top speed is seldom required. The turbine condensate passes through preheaters in the domestic water supply and then to the sewer. The water from the cooling tower on the roof, after passing through the refrigeration condenser, goes through the steam turbine condenser.

Labor Is Biggest Cost

By far the largest item in the cost of operating the cooling system is labor. A chief engineer, two licensed refrigeration engineers, and a mechanic are employed the year 'round who would not be employed if there were no refrigeration. Added together with all costs such as payroll taxes, welfare funds, etc., these men cost the owner $20,000 per year. There still remain a superintendent and the usual handyman who would be required regardless of the cooling system.

Steam Averages 6 Million Lb

Steam for driving the turbines for the summer of 1954 amounted to 5,406,000 lb. This was a rather cool summer. In 1955 the summer was abnormally high, both as to temperature and humidity, and the steam consumption jumped to 7,567,000 lb. A more nearly average consumption of 6,500,000 lb is taken, and this steam adds $5400 to the cost.

Steam for all other purposes is separately metered, except for a minor overlap between heating and cooling steam for a few days spring and fall.

Cost of Electricity Under $7000

Whereas the Consolidated Edison Co. has a master meter for electric power for the whole building, the owners have their own meters for various services. All of the air conditioning motors for driving the fans and circulating pumps are on a separately metered circuit. For the year October 1, 1954, to September 30, 1955, this meter showed 570,380 kwhr, which added $11,543 to the power cost.

Now, the fans are used during the winter for circulating tempered air for ventilation, especially for the interior spaces, which would otherwise not be rentable as office space. Therefore, a deduction should be made for the kwhr used during the winter, although this is a debatable point. This is easily calculated from the meter reading during the winter months and would amount to 222,600 kwhr, leaving a net charge against cooling of only 347,780 kwhr at a cost of $6838.

Make-up Water Cost Seem Low

Make-up water for the cooling tower goes through a separate meter, which during the 1955 cooling season recorded 169,623 cu ft. Of this amount, 2262 cu ft was used for filling the tower and riser at the start of the season and was drained out at the end of the season to prevent freezing. The actual make-up water to account for drift and evaporation was therefore only 167,361 cu ft. There are no meters on the condenser water lines; but while this make-up water cannot be determined as a percentage of the total water circulated, it is small. The cost of this water was $339.

It is interesting to note that three

circulating pumps were installed, each rated at 1750 gpm. Two were to serve alternately for condenser water and the third was to serve as a standby for both condenser and chilled water. It has been found, however, that only one pump is needed on even the hottest day, indicating 1.75 gpm per ton of installed refrigeration. Since this is low, there may actually be an excess of installed capacity, and this would help to account for the low make-up water.

Expect Repairs To Rise

Repairs to the air conditioning system have been low in spite of considerable corrosion prevention work around the cooling tower. The compressors and turbines are scheduled to be overhauled every five years. The actual repair cost in 1954, the seventh year of operation, was $535. No doubt this may go up with the increasing age of the equipment.

Water treatment is done by an outside specialist at a cost of about $677 per year.

Total Cost Is $33,789

Summarizing these costs, we have:

Labor	$20,000
Steam	5,400
Electricity	6,838
Water	339
Water treatment	677
Repairs	535
Total	$33,789

Divided by the 258,000 sq ft of rentable area, this cost is 13.1 cents per sq ft. If electric power for the whole year is included, the cost would be $38,494, or 15 cents per sq ft. (See the March 1955 HPAC, Page 120, where, in an article by the author on the cost of air conditioning in office buildings, the range of from 13 to 20 cents, obtained from many sources, was given.)

This operating cost is equal to from $34 to $38.50 per ton of installed refrigeration. A recent publication entitled "Air Conditioning Guide for Office Buildings," issued jointly by the Building Owners and Managers Association and the Electrical Association of Philadelphia, states that the operating cost of what is called the "larger" system — one requiring an operating engineer in constant attendance — runs from $40 to $60 per ton, based on 250 sq ft area per ton. Since 445 Park Ave. has 258 sq ft per ton, it ranks at the low end of the scale in both comparisons.

There is, of course, the "owning" cost, consisting of amortization, interest, taxes, and insurance. These are charges which individual owners set up according to their own ideas of rates, so they are not included in this article, which relates purely to the operating costs. Any attempt to figure the owning cost at 445 Park Ave. would be misleading anyway because the investment would be based on 1947 prices.

Use Outside Air To Cut Costs

Leases require that the owner furnish cooling between June 1 and October 1, but as a matter of tenant service the plant is made ready to run during May and is actually put into operation whenever there is indication that the outdoor temperature is likely to go above 65 F during the day, especially if the humidity is high. Similar service is rendered in October.

Due to the large capacity of the fans and ducts for handling outside air, comfortable conditions can be maintained at 65 F and higher, when the humidity is not too high, by air circulation alone without any refrigeration. Thus, during the spring and fall much operation of the compressors can be cut out. This helps to keep the cost of cooling on the low side.

The cooling system is operated during the summer five days per week from about 6 a.m. to 5:30 p.m. The circulating fans are also run Saturdays till 1 p.m., so they run five and one-half days per week the year 'round except for holidays.

Troubles Have Been Minor

No serious troubles have been encountered in eight years of operation. Because of considerable corrosion around the cooling tower, three years ago the exposed steel surfaces were sandblasted and coated with a mastic similar to that used for undercoating automobile bodies.

Vibration from compressors and machinery in the subbasement caused trouble when the basement space was rented for office use five years after the building was erected.

There was also trouble with the cooling tower fans running backwards during times of high wind, so that the motor fuses blew when the power was cut in. This was corrected by magnetic brakes to prevent backward running.

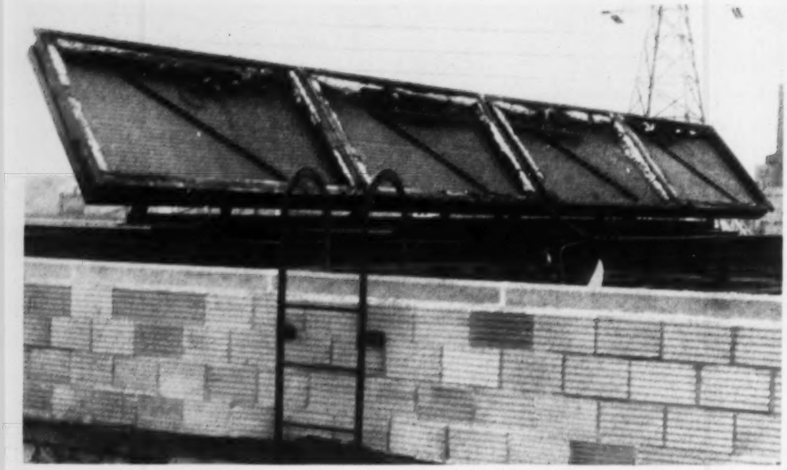
Compares With Other Systems

This type of air conditioning system is often referred to as the "conventional" type and is sometimes called outmoded, compared to high velocity air systems with induction units in each room, or to systems using so-called "fan-coil" units. However, it is apparent that the operating cost of this system compares favorably with these other systems. But it should be kept in mind that the type of tenant service rendered and the intelligence and attention of the operating engineers can make big variations in operating cost and thus throw comparisons out of line.

One thing very much in the system's favor is that it has few filters, and these are in fan rooms where they are easily reached without disturbing tenants. Also, there are few bearings to require periodic oiling.

On the other hand, there are steam traps to be cleaned every few years. Perhaps the chief drawback to this system is the difficulty of providing individual temperature control for small office spaces. Thus, it seems more adaptable to buildings with large tenant spaces where the zone control can be coordinated with the partitioning in mind. In 445 Park Ave. most of the tenants occupy entire floors.

The architects were Kahn and Jacobs. Consulting engineers were Jaros, Baum, and Bolles. The air conditioning system was installed by Kerby Saunders, Inc. ‡



ROOF SOLAR TRAP to collect solar and sky radiation for a heat pump system consists of four evaporator plates of 16 gage steel in an insulated enclosure covered with two glass plates. Glass covers are removed. The operating cycle is identical to a conventional refrigeration cycle. Via a refrigerant, heat is transmitted in the condenser to the circulating water. The heated water is then delivered to the storage tank for use in the heating system

Solar Heat Pump Beats Handicaps

. . . of direct utilization collector. Operating at lower temperatures, it reduces transmission losses and increases efficiency.

By Philip Sporn and **E. R. Ambrose**
President **Head, Air Conditioning Div.**
American Gas and Electric Service Corp.

A practical and acceptable solar heating system must have a high collector efficiency, be relatively free of operating and maintenance difficulties and be competitive in first cost with other heating systems.

Many ingenious, direct utilization, solar collectors for comfort heating have been described in the literature. Usually these traps are thoroughly insulated and have single, double, or triple glass covers for maximum retention of the heat and minimum heat loss to the ambient air. Only a relatively few of these traps, however, have been installed to date because of their complexity and high cost.

The heat pump offers several possibilities for overcoming some of the present handicaps facing the direct utilization collector. The heat pump, for instance, has the inherent ability to maintain a relatively low collector temperature. Operating at these lower temperatures reduces transmission losses which, in turn, materially increases the collector efficiency. At the same time, these low collector temperatures permit obtaining a larger percentage of the lower intensity solar energy.

FIELD TESTS from 1950 to 1955 to explore practical and suitable solar collector designs for heat pump applications yield several important recommendations and advantages. While the results are by no means conclusive, they are believed sufficient to give a good indication of what can be expected with a solar heat pump design.

The solar collectors used in these tests were mounted on the roof of a one-story brick building near New Haven, W. Va. This is in an industrial area along the Ohio river at roughly 39 deg N latitude and is about 600 ft above sea level.

The trap, consisting of four surfaces 4 ft high by 7 ft long, has a total exposed area of 112 sq ft. Each of the four surfaces consists of two 16 gage steel plates fabricated to form a number of parallel refrigerant circuits. These are in an insulated enclosure with two removable glass covers. Since this was an experimental unit, an adjustable base was provided to permit changing the orientation as well as the angle of tilt. For the tests, the trap was adjusted to face south at an angle of 50 deg from the horizontal.

How the System Operates

The heat pump flow diagram used in the tests for collecting the solar and sky radiation is shown in Fig. 2. The operating cycle is identical to a conventional refrigeration cycle. The compressor circulates the refrigerant between the evaporators, which are kept at about 60 deg F or lower, and the condenser, which is usually about 110 F or higher.

The refrigerant changes from a liquid to a gas in the evaporator by obtaining the needed heat of vaporization from solar and sky radiation. To complete the cycle, the

This article is an abstract of a paper by the authors presented at the World Symposium on Applied Solar Energy at Phoenix, Ariz., November 1955.

refrigerant changes from a gas to a liquid in the condenser by giving up the latent heat of vaporization to the circulating water. The heated water is then delivered to the storage tank for use in the heating system.

The operation was limited to daytime periods, and low temperature cutouts prevented operation below certain outdoor temperatures.

Three other operating controls were used during the tests, in addition to the two mounted on the roof. A low and a high pressure safety cutout prevented compressor operation below and above predetermined refrigerant pressures. A storage tank immersion thermostat prevented compressor operation at water temperatures above 120 F.

Improve Performance in Tests

Temperatures and refrigerant pressures were recorded intermittently from February 1950 to May 1955. During this period, a number of combinations and arrangements were explored to improve the operating cycle and take maximum advantage of the inherent characteristics of the heat pump. At various times the solar trap was operated with two glass covers, with one glass cover, and finally with no glass cover. The compressor speeds were changed from 835 to 620 and then to 440 rpm to obtain a better balance between the compressor and the solar trap. The solar heat pump was operated on cloudy days, clear days, rainy days, and over a wide range of outdoor temperatures.

The amount of available heat recovered by the solar trap increased proportionately to the compressor speed. The disadvantage at the higher compressor speeds, however, is the resulting lower coefficient of performance. In order to explore the possibility of improving the coefficient of performance, the compressor was operated at the lower speed during the latter part of the field tests.

The first field tests used double glass covers over the evaporator plates. Shortly after the tests were started, however, a change was made

(Continued on Page 110)

• here's what field tests show

1. *A relatively high collector efficiency can be obtained.* The tests show that the percent of available heat recovered by the solar trap can easily vary from 50 to 100 percent, depending upon the many influencing factors. For example, daily recovery rates on two different days were 224 and 179 Btu per hr per sq ft, which represent 78 and 56 percent, respectively, of the available solar and sky radiation as measured by the pyrheliometer.

2. *The collector-compressor selection must have approximately a 60 F temperature balance point for optimum performance.* It developed, during the tests, that the compressor was too large for the solar trap and the heat storage was insufficient. These two factors contributed to a low suction temperature and a high condensing temperature, with a corresponding lower overall system efficiency than would be expected on future designs. Both sides of the double plate surface were not effectively used during the tests which contributed to the low compressor suction temperature. Perhaps both sides can be used on future designs or finned type surface with a high air side/frontal area ratio may be the ultimate answer.

3. *The collector must be able also to use outdoor air as the heat source.* Even with the relatively high collecting efficiencies obtained during the tests, it appears that a practical heat pump solar trap must be able, in view of our present limited knowledge of storage and collectors, also to use outdoor air as the heat source. This may mean the elimination of the glass covers for proper operation. Eliminating the glass covers and the accompanying enclosure may be one of the most direct ways of obtaining a lower first cost trap, if the performance is not adversely affected.

4. *The solar collector can also be used as a heat sink for cooling.* A solar collector, free of glass covers, and an enclosure could be readily adaptable as a heat sink for summer cooling, increasing its acceptability.

5. *The performance of the trap is affected by geographic location.* Undoubtedly, improved performance would have been obtained if the tests had been made in a location having a higher percentage of sunshine. Even in such an unfavorable location, there were only 10 days from January to May 1955 when the heat pump did not operate because of insufficient solar and sky radiation.

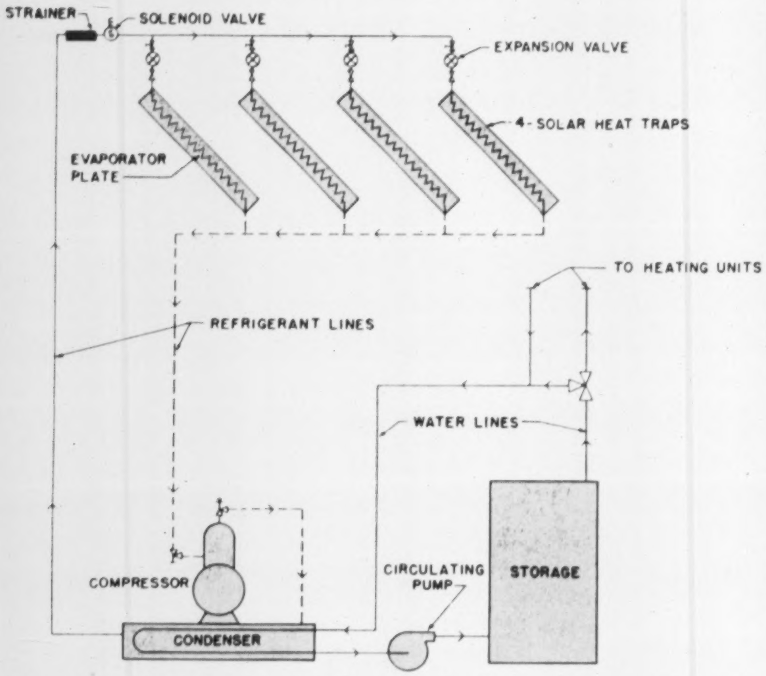
6. *The solar collector heat pump can have an operating advantage over a straight air source design.* It has been demonstrated that the solar heat system can have an appreciably higher coefficient of performance than systems using only outdoor air as the heat source. The tests indicate that it is not unrealistic to expect coefficients of 6 to 8 on solar heat pump designs in the immediate future. Such performance values will not only provide a practical and effective way of using solar and sky radiation, but will also materially improve the competitive position of the heat pump with the fuel fired heating system.

7. *The solar collector heat pump water heater has promise.* The solar heat pump water heater has perhaps equal if not greater promise than the comfort air conditioner. It is well suited to a selfcontained, quantity production item, and with proper development could have wide public acceptance in many areas. Both types of systems have the common advantage of being able to employ a relatively free, long life, hermetically sealed refrigerating system.

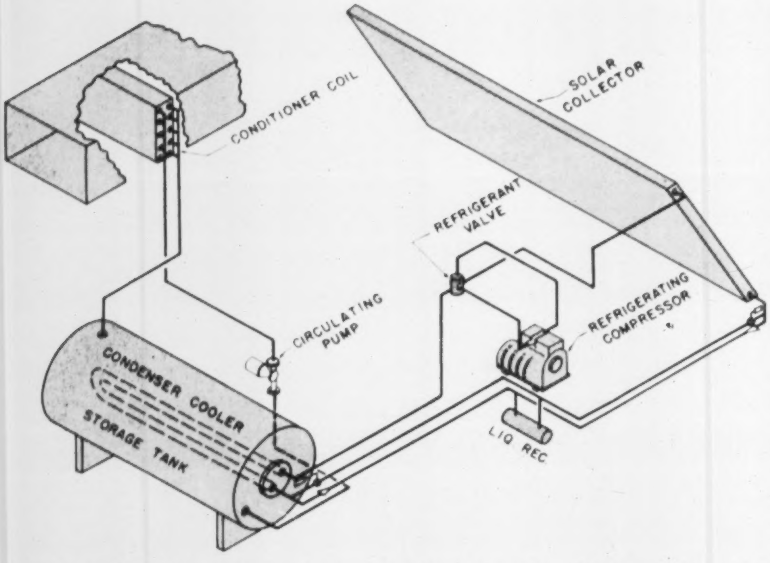
These test results on the heat pump solar collectors can only be considered as exploratory in nature. No attempt was made to obtain extensive, detailed data of the entire system, but instead the investigations were restricted to the performance of the trap itself. Although the data obtained will not permit definite conclusions or design recommendations, it does indicate the probable performance of this type of system and is sufficiently encouraging to warrant additional research.

to single glass covers. During the testing period, a number of checks were made on the recovery heat rate of the collector without glass covers. Although these checks were not conclusive, because of the many variables involved, it appeared that the heat rate was not seriously affected by the removal of the glass covers.

To explore the operating characteristics of a heat pump solar collector, without glass covers, a series of tests was made on the bare evaporator plates. A pyrheliometer and a six point temperature recorder were installed during the series to obtain more informative data.



FLOW DIAGRAM for solar heat pump system shows how heat is removed from traps in refrigeration cycle. Compressor circulates refrigerant between evaporators, which are kept at 60 F or lower, and the condenser, which is usually 110 F or higher



COOLING CYCLE may be put in operation by means of a refrigerant valve which changes the direction of the refrigerant flow. The same surface used as a heat source for winter heating serves as a heat sink for summer cooling

A six point recorder was used to obtain continuous temperature readings of the pyrheliometer, outdoor air, water to and from the condenser, and the refrigerant entering and leaving the compressor.

The belt driven compressor has two cylinders with 2¾ in. stroke, 2 in. bore, and a 27 cu in. per revolution displacement. A 5 hp motor operated the compressor at speeds of 875, 620 or 440 rpm.

The pyrheliometer was mounted on the frame of the solar collector in a plane parallel to the evaporator plates. A photoelectric cell limited compressor data.

Frequently the outdoor temperature was considerably above the solar collector temperature, which allows the air as well as the solar and sky radiation to serve as the heat source. This would explain why the solar trap recovery rate in some instances, exceeds the available solar energy as measured by the pyrheliometer.

Balance Point Is 29 F or Lower

The balance point of the saturated refrigerant suction temperature and the solar trap is 29 F or lower and varies from 14 to 40 F below the outdoor temperature. Such a high outdoor-refrigerant temperature difference increases the heat exchange between the outdoor air and the trap, but adversely affects the coefficient of performance. This balance point can be raised by increasing the size and/or collecting efficiency of the trap. The effect of increasing the size of the collector was simulated by reducing the compressor speed to 440 rpm for one test. In this test, the compressor-solar trap balance point was appreciably higher than in the one before.

The heating output from the heat pump system always exceeds the refrigerating effect by the heat equivalent of the work of compression necessary to produce the effect. The additional heating effect may vary from

30 to 50 percent of the refrigerating effect, depending upon the condensing and suction temperatures.

High Suction Temperature Best

The capacity and the coefficient of performance increase as the suction temperature increases and the condensing temperature decreases. Consequently, a system should be designed to operate at the highest possible suction temperature and the lowest possible condensing temperature.

For a given condensing temperature, the compressor kilowatt input decreases instead of increasing with the suction temperature above a certain point. This is due to two influencing factors which tend to oppose each other. As the suction temperature rises, the density of the refrigerant increases with a corresponding increase in required horsepower. On the other hand, as the saturated suction temperature increases, the compression ratio decreases, with a resulting decrease in the required horsepower. In the solar heat pump, since the suction temperature is not limited by design conditions, it should be the aim to have the latter condition predominate to obtain a maximum coefficient of performance.

A coefficient of performance — *COP* — of 6 to 8, was obtained when operating at about 60 F suction temperature and 90 to 112 F condensing temperature. *COP* defined, is the ratio of heat output — heat to the storage tank — to the heat equivalent of the work required to produce the effect. Suction and condensing temperatures of this magnitude are feasible at the present time on cloudless days. It is questionable, however, if a practical competitive system could be designed, in view of our present limited knowledge of heat pump storage and solar collectors, unless outdoor air could also be employed as a supplemental heat source for winter heating as well as a heat sink for summer cooling.

Reverse Cycle for Cooling

The same surface used as a heat source for winter heating can be adapted to serve as a heat sink for summer cooling. The compressor will furnish the summer cooling as well as the winter heating by means of a refrigerant valve which changes the direction of the refrigerant flow. The collector plate, free of glass covers or enclosure of any kind, can be mounted in a south facing vertical position. This type collector can be located on the roof or side wall and, in fact, it may be possible for it to serve as part of the roof or side wall without detracting from the appearance of the structure. With such a solar collector design, the rain, wind, solar and sky radiation, and the outdoor air can all be made to serve as a heat source and heat sink.

Outdoor air can be circulated over the collector in order to provide a heat source during those periods when solar heat is unavailable. This same forced circulation system can be used during the cooling cycle, if gravity circulation over the collector is insufficient, to maintain reasonable condensing temperatures.

Heat Domestic Water

The same collector-condensing unit combination can also be used for heating domestic water. The water heater could be combined with the year 'round comfort air conditioning system or made a separate selfcontained unit. One possible solar heat pump water heater is similar to many of the heat pump water heaters now in service, except that the solar collector would be substituted for the forced air refrigerant coil. The same provision for using air as the heat source when the sun is unavailable, described for the comfort year 'round system, can be used in the domestic water heater design. In this way, an unusually large storage tank would not be used. A heat pump water heater, using solar and sky radiation, as well as outdoor air as the heat source, has attractive possibilities and could receive wide acceptance in many areas.

Store One Day's Supply

With a high temperature storage system, the water is stored during the heating cycle by means of the heat pump, so that it can be directly used to heat the space. Conversely, during the cooling cycle, the stored water can be used to directly cool the space. Another possibility is to have low temperature storage. In this arrangement, the solar energy stored at, say, 50 to 60 F serves as the heat source for the heat pump. Each of the designs has its advantages and disadvantages. The exact storage arrangement will not materially affect the design or operation of the solar collector.

However, a certain amount of storage is necessary for the surplus daytime solar energy, otherwise a collector would be of relatively little economic value. But storage in excess of one day's supply may be difficult to justify in a solar heat pump design when outdoor air is used as supplemental heat source. Ultimately, the size of a storage system will depend to a great extent on the future progress in finding a low cost storage material with a relatively high storage capacity per unit volume.

Full Capacity Seldom Needed

An important consideration in the sizing of a storage tank, as well as in the sizing of the solar collector, for that matter, is the exceedingly small percentage of the season that the full design heating capacity is needed. For example, 90, 80, and 70 percent for the design heating capacity will equal or exceed the building requirements 99, 98, and 96 percent, respectively, of the heating season. Thus, supplemental heating would be required for only 240 hours of a 6000 hr heating season if 70 percent of the design heating capacity were installed. This relationship applies throughout most of the U. S. and must be properly evaluated in the sizing of the equipment.

In general, using large size, high first cost equipment, just to satisfy the maximum heating requirements, which occur a relatively short period of time, cannot be justified. This is another reason why storage may ultimately play an important part in obtaining a practical solar heat pump system. ‡

Plant Maintenance Know-How

Forty-five experts from all types of industries led the discussions at the seventh Plant Maintenance and Engineering Conference in Philadelphia recently. The three-day conference, which drew about 2500 engineers, ran simultaneously with the Plant Maintenance and Engineering Show, the latter running an additional day.

The show is one of the largest annual industrial expositions in the U.S. More than 20,000 executives attend each year.

The conference is also the largest of its kind.

Most conference sessions were general in nature and covered all types of industries. However, five industries received special attention, with separate sessions devoted to each. These included air transport, chemical, petroleum refining, paper mill and paper product, and textile.

Among the topics of special interest to heating, piping, and air conditioning engineers and contractors are the five presented here in brief.

Pipe Material Study Cuts Maintenance Two-Thirds

. . . aluminum pipes hot water

NEW PIPING MATERIALS are being constantly investigated by the Westinghouse Electric Corp. as part of its program to control maintenance cost and quality, said Charles J. Zetler, Jr., works engineer. Where improved performance over materials presently being used appears likely, trial amounts of these new materials are installed and careful operating records are maintained.

As an example, 10 miles of aluminum pipe has been installed for hot water service in the plant, with the result that the cost of maintaining the hot water system has been cut two-thirds, Mr. Zetler said.

"We had been using steam and gas heated service water heaters at each location in the plant where hot water was required. The engineer on this type of work decided that the same, or better, hot water service could be provided at a lower annual cost by installing a central system. So a small recirculating system was installed with sections of various pipe materials that were considered as having good possibilities. For two years the sample sections were examined every six months.

"The sample that first showed indications of failing was aluminum. Electrolysis was causing severe pitting for a distance of several inches from where the aluminum pipe joined a dissimilar metal pipe. The pitted section was cut off and an insulating joint installed. In the balance of the test, aluminum pipe proved very satisfactory, and it was selected. An indirect benefit was the ability to provide treated hot water to all location," Mr. Zetler reported.

Maintenance Painting For Piping, Ducts

. . . requires careful preparation

WHILE THE USE of specification paints as a corrosion preventive is increasing, specifications do not control the application or later inspection, said Fred B. Leitzsey, consulting engineer, Bureau of Yards and Docks, Dept. of the Navy.

These recommendations apply to piping and ducts, as well as to other heating, piping, and air conditioning equipment.

Four factors that should be considered in establishing a well rounded maintenance painting program are inspection, surface preparation, selection and application.

Surface preparation is one of the most critical and important factors which govern the performance of paints. Proper cleaning should be combined with a treatment of the cleaned surface to increase its affinity for subsequent painting. Many new coatings now on the market require a broad knowledge of precise end conditions that must be met at the surface of the material in order to produce the maximum adhesion and bonding. Blast cleaning is considered superior to wire brushing; however, it is more costly and often undesirable, Mr. Leitzsey said.

Extensive use has been made on metals of the so-called "wash-primer," a pretreatment phosphate type brushed on coating. This pretreatment, developed by the Navy, shows excellent results when used on blast or chemically cleaned steel surfaces. It is particularly good for surfaces exposed to severe corrosive conditions or immersed in water, he said.

Both phases — cleaning and pretreatment — should be thoroughly explored before initiating a repainting program. The degree of surface preparation should be balanced against the increased life expected.

Improper application of paints may result in premature failure of the coating even over properly cleaned and treated surfaces. Negligence in application may result in greater variations than that exhibited between brush and spray techniques.

Takes Carefully Planned Program

. . . say experts at Plant Maintenance and Engineering Conference

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The four major methods of application are brush, spray, roller, and dip. Each method has its advantages and disadvantages, depending upon the job to be accomplished. Roller coating has grown during recent years and excellent results have been achieved by this method where spray coating cannot be used due to the hazards from overspray or flammability of the solvent.

Paints normally are applied as they are supplied in the container without further thinning. Thinning, when considered necessary, should be done only under the supervision of a competent supervisor.

Temperature and humidity govern when paints may be applied. 45 F and 90 F are the minimum and maximum application temperatures within the range of 10 to 70 percent relative humidity, he suggested.

Duct Design Changes Result in Savings

. . . shop layout changed

SHEET METAL duct fabrication required in large amounts on a recent job at the Westinghouse Electric Corp. was accomplished at a saving of several thousand dollars with only minor changes in shop layout and duct design, said Charles J. Zetler, Jr., works engineer.

The completed design and specifications were forwarded to the industrial engineer who, working with the sheet metal foreman, found that by doing some rearranging in the shop layout and the purchase of several inexpensive tools, a saving of several thousand dollars could be made. An additional saving of several thousand more dollars could be made with some slight changes in design of the ductwork. A meeting was held with the design engineer, who agreed to the design changes and revised the drawings and specifications. The saving will be a continuing one, as all future ductwork will benefit from the improved methods, he said.

Outside Contractors Increase Efficiency

. . . save time and money

INDEPENDENT CONTRACTING for heating, piping, and air conditioning maintenance jobs has proved economical as well as practical for the refractories division of the Carborundum Co., said Henry M. Killmar, manager, technical services.

Independent contractors in use as an adjunct to the normal engineering, supervisory, and maintenance or mechanical section work force can be of great help in accomplishing the overall program, because they make available to the plant engineer an additional pool of talent and manpower which can augment the efforts of his own organization. Contractors do the work we cannot do, and scheduling efficiency goes up.

Contracting of this type requires a high degree of engineering effort. The type of work involved will largely determine whether a cost plus fixed fee, guaranteed price, or guaranteed maximum with split savings contract is written. The nature of the work indicates that it is more often economical to place the order on a time and material plus overhead and profit basis, he said.

In order to rely upon contractors for skilled tradesmen, good supervision, and a high degree of general performance, the plant engineer must realize that cooperation works both ways. A history of mutually profitable contracts brings confidence, and the plant engineer can count on high grade service even in emergencies. The best guarantee of value received is a background of fair dealing.

It seems unnecessary to point out that the contractor is as anxious to maintain good labor relations in his crew as are the managements of the plants in which he works. Be sure that parking facilities, first aid facilities, service buildings, and normal employee comforts for the contractor's crew are available, and in return you can expect that they will observe safety and smoking rules and leave the area clean and safe when the job is completed.

As contracting becomes a regularly used tool of maintenance managers, the plant engineer and his supervisors must assume a large burden of liaison between contractors, their employees, and the plant personnel. Failure to perform this job adequately will defeat the purpose of contracting, Mr. Killmar said.

Balance and sound judgment are required and if normal business practices are employed, the plant engineer can increase his overall effectiveness by using contractors.

Centralize Maintenance Shops for Efficiency

. . . design for special functions

CENTRALIZED MAINTENANCE SHOPS, each designed for special work, along with area maintenance have resulted in many advantages for the Armco Steel Corp.'s Middletown, Ohio, works, said J. E. Baltzell, Jr., assistant to the assistant superintendent of maintenance in charge of maintenance shops.

The design and operation of maintenance shops for petroleum refining plants require shops set up for maintenance work for pipes, valves, special refining equipment, and must include consideration of problems of corrosion, pressure failures, and the extreme dangers of fire. Likewise, a shop for chemical plant with special problems peculiar to chemicals and their handling requires a different design and method of operation. Operations such as drying, compressing, pumping, filtering, special materials for pipe corrosion prevention and control must be considered. Methods of disposing of these chemicals efficiently must be adequate and an effective means of handling the chemicals must be used.

"Again, at Armco we have problems in maintenance peculiar to the steel industry. The plant employs 5400 people. Slightly over 1200 are maintenance people, or a ratio of one maintenance man to four operating people. Forty-two are pipe fitters.

"Our maintenance organization is broken down into two main groups: the assigned maintenance and maintenance shops. The assigned group is assigned in the various production departments to maintain the equipment and machines in those departments. Standard, adequate crews have the responsibility during operations of inspection, lubrication, making running repairs, and preventive maintenance checks. This assigned group employs 700 men and is limited in scope as to crafts, equipment, and manpower to complete all the maintenance jobs in keeping the plant in operation.

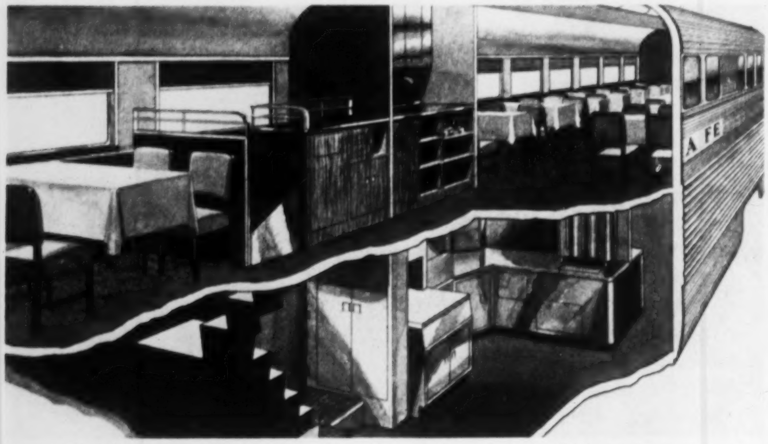
"Therefore, the maintenance shops are a direct and ready means to have skilled craftsmen available in an integrated maintenance program throughout the plant. The shops are the central location for special equipment and tools needed to complete special work. Centralizing the shop program in reference to location and equipment reduces capital expenditures. Also, the shops give a ready source for both skilled manpower and machines during the emergency and unexpected breakdowns in plant operations. Furthermore, the shops are utilized for plant expansion and building programs. But this use is limited since disastrous results could develop if maintenance items were set aside for some elaborate new expansion.

"Our shops are in a central spot covering 10 or 12 acres, which include a centralized store and supply depot for the entire plant. Our pipe shop occupies about 6500 sq ft. Areas of all shops total 140,300 sq ft, or 3.3 acres.

"The shops were not developed entirely by design but existing buildings were utilized through the years as the plant expanded and grew. For example, at one time our blacksmith shop was in the building now occupied by the pipe shop. In general, the housing is quite adequate. Related crafts are grouped together.

"A central office plans and schedules work order requests on a priority basis. The results are better work control, better work planning, better spare parts control, better preventive maintenance, and better morale." ≠

New "Hi-Level" Trains Get Waterless Air Conditioning



DINING CAR seating 80 people has two 10 ton air conditioning systems

DRY-OPERATING AIR CONDITIONING systems are being installed in 47 new "Hi-Level" passenger cars for the Santa Fe Railway, according to the Trane Co.

The new cooling systems eliminate water supply and service for the condensers. The air conditioning is going into 35 chair cars, six diners, and six sky dome lounge cars.

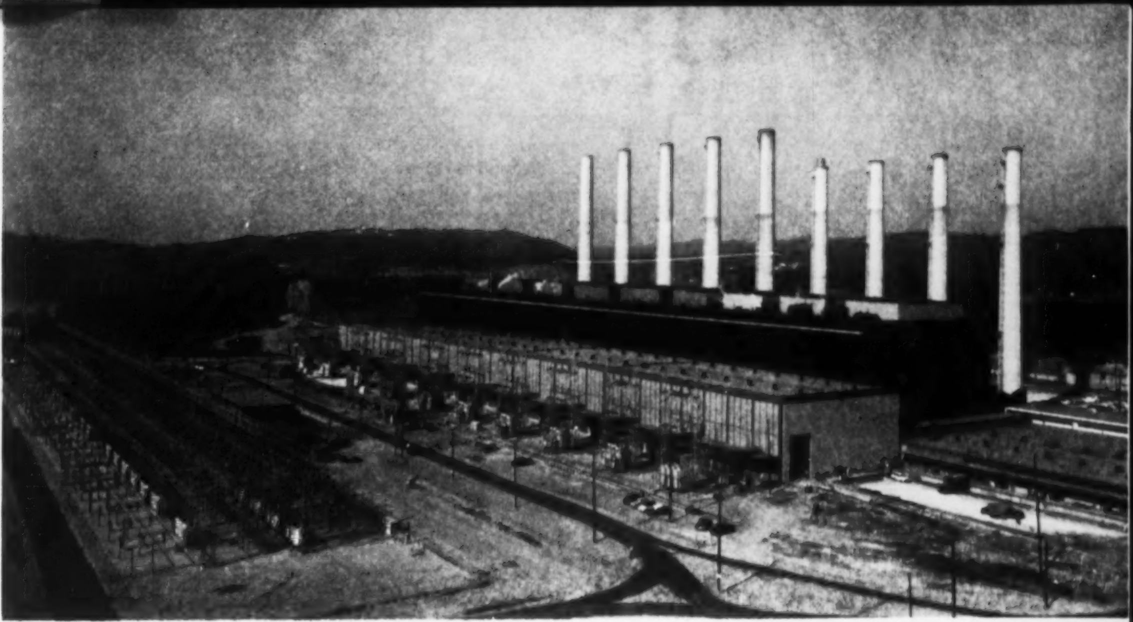
The air conditioning equipment fits in a compact compartment at each end of the car, over the wheels, instead of being suspended below the floors exposed to dust and dirt.

With vestibules eliminated on the passenger level, the chair cars will carry 28 more passengers than conventional cars. Center doors are located on both sides of the car, on the lower level. Baggage space and rest rooms off the vestibule are also air conditioned.

Dining cars posed special air conditioning problems, with 80 diners occupying the entire upper level, and the all-electric kitchen, connected by elevator, situated below. The high heat and humidity from the kitchen and the large number of passengers will be handled by two 10 ton air conditioning systems.

Each sky lounge dome car also will have two 10 ton systems. A dome car seats 84 passengers on upper and lower decks, and includes a news stand, refreshment bar, and rest rooms.

Twin air conditioning systems each of 8 ton capacity will serve each chair car. ≠



Here's How Piping Was Designed for

The World's Largest Steam Plant

To guide designers and draftsmen, the flows for the various piping systems were tabulated and velocities and pressure drops were calculated, based on assumed routings. These factors were recalculated after the final routings were established, and adjustments in sizes were made where necessary.

Described here are systems for high temperature high pressure main and reheat steam, boiler feedwater, extraction steam, drains, vents, and blowdown, raw service water, compressed air, hydrogen, vacuum cleaning, and oil storage and transfer.

By Roy E. Lyon

Mechanical Engineer, Design Div.
Tennessee Valley Authority

KINGSTON steam plant, near Harriman, Tenn., is the fifth steam generating plant designed and built by the Tennessee Valley Authority. It is the largest in the world.

The nine units in the plant have combined capacity of 1.6 million kw. The steam conditions for which the piping was designed are 1800 psig, 1000 F with reheat to 1000 F for Units 1 to 4 and 1800 psig, 1050 F with reheat to 1050 F for Units 5 to 9. Units 1 to 4 have a capability of 150,000 kw each, and Units 5 to 9 have a capability of 200,000 kw each.

All piping was designed, fabricated, and installed in accordance with appropriate sections of the American Standard Association Code for Pressure Piping and the American Society of Mechanical Engineers Boiler Code in effect at the time of design. As a guide for the designers and draftsmen, the flows for the lines of the various principal piping systems were tabulated and velocities and pressure drops were calculated, based on assumed routings through the plant. The line sizes, velocities, and pressure drops were recalculated after the final routings were established and adjustments in sizes made where necessary.

The main steam piping for all units is low alloy steel, forged and bored. For Units 1 to 4, piping is 16¼ in. outside diameter by 2⅜ in. thick walls for full 1 million lb per hr steam flow and splits into two 13½ in. OD by 2 in. thick lines before the turbine throttle valves. The pipe conforms to American Society for Testing Materials Specification A-158*, Symbol P-11, containing 1¼ percent chrome and ½ percent molybdenum. Piping for Units 5-9 is 17 in. OD by 2½ in. thick for full 1.28 million lb per hr steam flow and splits into two 15¼ by 2⅜ in. thick lines just before entering the turbine stop valves. The pipe conforms to ASTM Specification A335, Symbol P-22, containing 2¼ percent chrome and 1 percent molybdenum.

The reheat steam piping for Units 1 to 4 is 20 in. OD, Schedule 80, for full flow and splits into two 16 in. OD,

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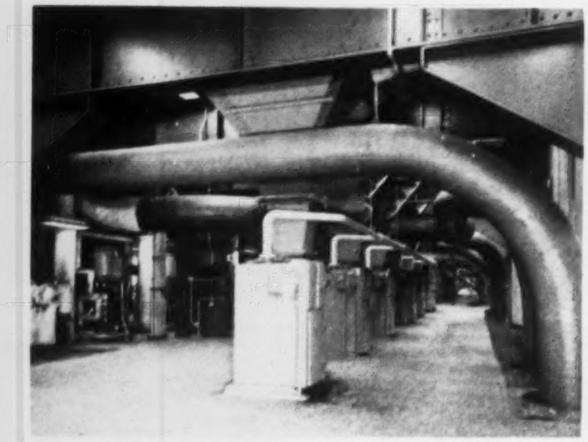
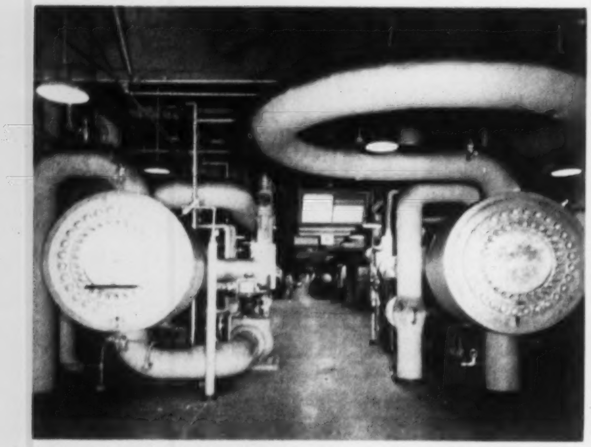
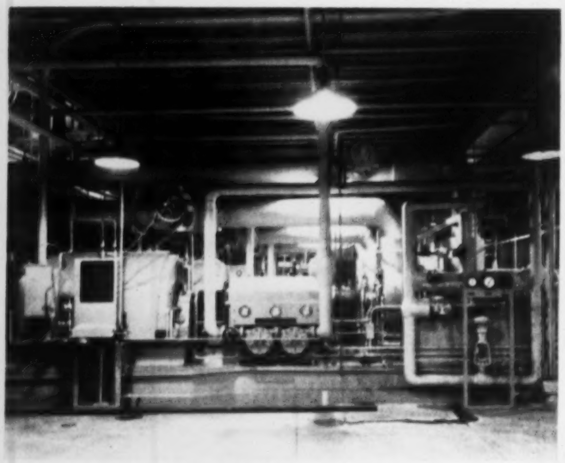
**A158 is now obsolete and is included in A335. While at the time the pipe was ordered one might still get A158 marking, this is no longer true. Materials covered by the last A158 specification — A158-52T — are now covered by A335-55T.*



MAIN STEAM LINES, 16¾ and 17 in. in diameter, are low alloy chrome-moly steel, forged and bored. Piping is welded throughout. Scene is in Unit 6



HEATER DRAIN SYSTEM cascades the drains from one heater to another of lower pressure, through diaphragm control valves, where possible. Heaters 2 and 3, Unit 6, are shown



BOILER FEEDWATER PUMPS are driven by constant speed motors through fluid drives, providing necessary pump speed variation to maintain water level in steam drums

. . . heater drain system

Schedule 80 lines before the intercept valves of the turbines. The pipe conforms to ASTM Specification A158, Symbol P-11, and was cupped and drawn from plate. The piping for Units 5 to 9 is 24 in. OD by 1 in. thick for full flow and splits into two 18 in. OD by ¾ in. thick lines before the intercept valves at the turbines. The pipe conforms to ASTM Specification A155, Symbol 2¼ CR, Class 1, electric fusion welded for high temperature service.

No valves are used in the main steam or reheat steam lines between the turbine and the superheater and reheater outlet headers, and the piping is welded throughout.

The turbogenerators are on center line and in front of the steam generators, with the units spaced to accommodate the long retractable soot blowers in the superheater and reheater of the steam generators. This arrangement gives the shortest distance between the superheater and reheater outlet headers and the turbine.

As in previous steam plants, the small superheater and reheater tubes run forward and down a short distance in front of the steam generators. Flexibility is provided thus instead of by long and expensive expansion bends in the large heavy wall piping.

The low temperature return steam lines from the turbines to the reheater inlet headers are carbon steel conforming to ASTM Specification A106, Grade B. Since the turbine outlet nozzles and the reheater inlet headers are relatively stationary, expansion is provided for by bends and turns in the piping. Two 14 in. Schedule 30 lines per unit serve Units 1 to 4 and two 18 by ⅜ in. thick lines serve each of Units 5 to 9.

Boiler Feedwater Piping Serves Eight Stages

Seven stages of feedwater heating are provided for Units 1 to 4 and eight stages for Units 5 to 9, with No. 4 heater in all cases being of the open, deaerating type. Condensate is pumped from the condenser hotwell through the low pressure heaters into No. 4 heater. From No. 4 heater the water flows to the suction of the boiler feedwater pumps and is pumped progressively through Heaters Nos. 3, 2, and 1 to the economizer inlet of the steam generator.

All piping between the condenser hotwell and the boiler feedwater pump suction is Schedule 40 seamless steel conforming to ASTM Specification A106, Grade B. All piping between the boiler feedwater pump and the steam generators is Schedule 160 seamless steel conforming to ASTM Specification A106, Grade B. All joints are welded except at the following points where flanges are provided for servicing equipment:

- Condenser hotwell outlet.
- Hotwell pump suction and discharge.
- Deaerator inlet and outlet.
- Boiler feedwater pump suction and discharge.

cascades drains from one heater to another of lower pressure

- Condensate regulating valve inlet and outlet.

All valves are cast steel body conforming to ASTM Specification A216, Grade WCB, with stainless steel trim. All gate, globe, and check valves are welded into the lines and all large valves in the boiler feedwater pump discharge lines are electric motor operated.

Electric motor operated, three-way valves in the condensate line to the low pressure heaters bypass the condensate around the heaters during startup or in case of difficulty with the heaters or controls thereon. Similar valves bypass the broiler feedwater around Heaters Nos. 1, 2, and 3 during startup or in case of trouble with the heaters.

The boiler feedwater pumps are driven by constant speed motors through fluid drives, thus providing the necessary speed variation of the pumps to maintain the water level in the steam drums.

Make-up water for the steam generators is normally provided by evaporators but may be provided from storage tanks built into the substructure of the powerhouse. These tanks — one per unit — are connected into the feedwater system ahead of the No. 4 heater in such a way as to provide for surges in the system and to provide a supply of water for sealing turbine and pump glands, etc. Level controllers on the No. 4 heaters control diaphragm valves in the make-up and bypass lines to regulate the level of the water in the No. 4 heaters. The level in the condenser hotwell is maintained constant by a level controller on the hotwell and controlling diaphragm valves in the hotwell pump discharge lines.

Extraction Steam Piping of Varying Schedules

All extraction pressures and temperatures on Units 1 to 4 are within the allowable temperature range for carbon steel pipe. So, this piping conforms to ASTM Specification A106, Grade B. The line to No. 1 heater is Schedule 80, lines to Heaters Nos. 2, 3, 4, and 5 are Schedule 40, the line to Heater No. 6 is standard weight — 0.375 in. wall — and the line to Heater No. 7 is Schedule 30.

On Units 5 to 9 the temperature in lines to Heaters Nos. 1 and 3 exceeded that allowable for carbon steel and low alloy pipe conforming to ASTM Specification A335, Symbol P-11, containing 1¼ percent chrome and ½ percent molybdenum was used. The line to No. 1 heater is 6 in. Schedule 80, and the line to No. 3 heater is 12 by ½ in. wall. Lighter weight pipe could have been used for the latter line but was unavailable. The remainder of the extraction lines are carbon steel conforming to ASTM Specification A106, Grade B, Schedules 40 to 30, depending on the pressure and availability of the pipe.

Valves are welded into the lines to eliminate joints wherever possible, and the piping is welded throughout except for flanges at high pressure heater shells to permit removal of shells for inspection and maintenance of tube bundles. The lines to the low pressure heaters in the condenser neck are welded to eliminate possible leaks that would require a shutdown to repair.

Positive closing check valves are in all extraction lines to heaters having sufficient volume to overspeed the turbine in case of loss of load. Ordinary swing check valves are in the other extraction lines where recommended by the turbine manufacturer.

The shutoff valves at Heaters Nos. 1 through 4 are electric motor operated and tied into the control system so they will be closed automatically in case of abnormally high level in the heaters.

Since all extraction lines are subject to subatmospheric pressures during startup, valved drain lines drain the lines to the condenser until the pressure in the lines is sufficiently high to operate the normal trapped drain lines.

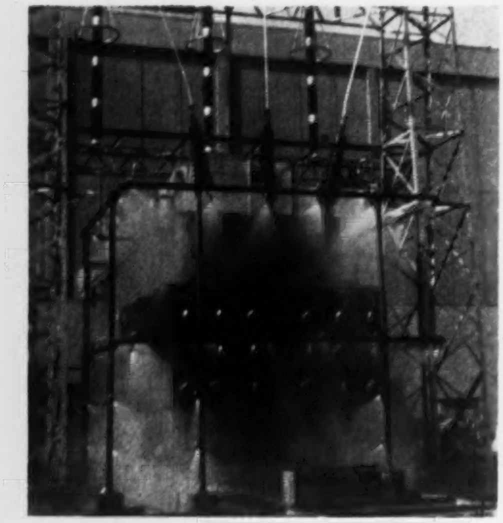
Flexibility is provided in the lines to Heaters Nos. 1, 2, 3, and 4 by bends and offsets in the piping between the turbine and the heaters. Corrugated type stainless steel expansion joints with internal guides are in the low pressure lines inside the condenser neck.

Drains, Vents, and Blowdown

The heater drain system cascades the drains from any particular heater to a heater of lower pressure, through diaphragm control valves, where possible. Due to low pressures in some of the low pressure heaters, these drains must be pumped forward into the condensate system.

Another factor considered in the low pressure heater drains is the large amount of condensate which is of little value in a lower stage heater and which complicates the piping problem by increasing the pipe sizes in what is usually a congested area. To take advantage of the heat available without putting excess condensate through the lower pressure heater, heater drains were arranged as shown in the center photo on Page 116.

The drains from No. 5 heater pass through a control valve to a flash tank which also serves as a drain tank for heater No. 6. Since the pressure in this tank is the same as in No. 6 heater, a portion of the drains from No. 5 will be flashed to steam and pass out of the top of the tank to the shell of No. 6 heater. That portion of the No. 5 drains not flashed plus the drains from No. 6 are then pumped forward into the condensate line between Nos. 6 and 5 heaters or into the inlet water channel on No. 5 heater. Heaters Nos. 7 and 8 are handled the same way except that No. 7 heater does not have a subcooling section, and a level control reservoir is required ahead of the control valve to provide sufficient capacity for satisfactory operation of the level controller. Since duplicate heater drain pumps are not provided, emergency drain lines from the pump suction headers to the condenser bypass the heater drains to the con-



FIRE PROTECTION SYSTEM for transformers includes permanent piping and atomizing spray nozzles which blanket the transformer in case of fire

denser in case of pump failure or during other emergency conditions. The flash tanks are below the heaters and high enough above the heater drain pumps to provide a positive head on the pump suction.

The drain lines between the heater outlets and the diaphragm control valves were designed for very low velocities to prevent flashing and erosion of the piping system. Piping on the discharge side of the control valves was kept as short and direct as possible, in most cases the control valve being directly over the heater opening into which the drains are discharged. All piping is seamless steel conforming to ASTM Specification A106, Grade B.

Gate and globe valves are cast or forged steel with stainless steel trim and welded into the line.

Diaphragm control valves for controlling heater drain flows are 4 to 6 percent chrome steel body with stainless steel seats and trim for all pressure 150 psig and above and for all temperatures 411 F and above. Control valves for lower pressures and/or temperatures are cast steel body with stainless steel seat and trim. All control valves are flanged and arranged to close on loss of operating medium. They were designed for a maximum flow approximately 10 percent in excess of the maximum calculated flow. The valves are controlled pneumatically from torque tube type controllers on the heater shells or drain tanks.

All control valves in the heater drain system are bypassed with hand operated V port globe valves of approximately the same size as the control valve port.

All steam safety valves have vents to carry the steam to 6 ft above the roof of the plant. In some cases this necessitated rather long lines. In all cases the vents have operated without objectionable blowback.

High pressure heaters and evaporators are vented to the No. 4 heater, which is in turn vented to the atmosphere through the vent condenser, thus conserving heat and releasing a minimum of vapor into the building. The low pressure heaters are vented to the turbine steam condenser. The piping is welded throughout, using socket welding fittings except that connections to heater shells are flanged. Valves are forged steel with socket welding ends. Those used for throttling service are of the V port type.

Raw Service Water System Totals 34,000 Gpm

Strained raw river water is used for cooling turbine oil, hydrogen in the generators, bearings, fluid drives, transformer fire protection, and other services.

Ten motor driven centrifugal pumps take their suction from the condenser water intake conduits and provide a total capacity of 34,000 gpm to a piping system throughout the plant. The system includes a horizontal loop header above the basement floor, with risers up through the boiler and heater bays to provide takeoffs for cooling water, floor washing, and fire protection. Outlets 1 in. in diameter are installed at strategic locations throughout the plant so that no more than 50 ft of hose is needed for any normal use. The loop header inside the steam plant is connected into the yard system through three 10 in. underground lines, and a 50,000 gal elevated tank is connected to the yard system through a double acting altitude valve to provide water for fire protection and other uses in case of emergency.

The piping system is standard weight steel pipe, with welding fittings for the larger sizes and screwed malleable iron for the smaller sizes. Valves, $2\frac{1}{2}$ in. and larger, are cast iron flanged body with bronze trim, and small valves are bronze.

The whole system is valved in such a manner that any unit can be segregated for repairs and maintenance or changes to the system at any time a particular unit is shut down.

Due to wide variations in water temperature from summer to winter, pressure switches start and stop three of the raw water pumps automatically to conserve power and relieve the operators of that responsibility. In addition, control switches are in the unit control rooms for nine pumps.

The power transformers adjacent to the turbine room wall have permanent piping and atomizing spray nozzles arranged to completely blanket the transformer in case of fire in the transformer. The water for this system is supplied from the horizontal loop header in the steam plant through solenoid operated diaphragm valves. Normally the system is dry and the solenoid can be energized in one of three ways: (1) manual control switches, (2) thermostats at strategic spots in the transformer, and (3) generator differential relays.

In another article to be published in an early issue, the author will discuss piping systems for compressed air, hydrogen, vacuum cleaning, and oil storage and transfer at the Kingston steam plant. ‡

Sam
Lewis'
Page

A warm air heating and cooling system in a two-zone ultramodern building . . .

Requires Balancing Twice a Year

. . . because it was incorrectly designed

HERE is the case of a structure that is heated by warm air and that is cooled by refrigerated air delivered alternately through the same supply ducts by the same fan.

The conception of the designer may have been sound, but he failed adequately to pre-vision the character of the building. It is an ultramodern type, with a long wing one story high, the floor on this wing being on the ground. There is a basement large enough only to contain the furnace, the fan and the refrigerating plant. There are two stories, however, in the part of the building directly above the furnace, and the air delivery ducts for this zone all are inside the building.

The air delivery ducts for the single story wing, however, are of masonry in the ground and there can be little if any air movement through these ducts unless the fan is delivering air continuously.

The control arrangements provide that if the furnace bonnet becomes sufficiently warm — and only then — will the fan operate. This is to prevent delivery of air so cool as to cause drafts. Presumably the fan operates continuously in hot weather under manual control, while the refrigerated air temperature is regulated by the evaporator pressure.

This heating system is difficult to balance in this building, since gravity encourages air flow to the two-story zone, while the one-story zone does not receive sufficient heat.

The owner was not very happy during the first winter though we throttled to the limit the dampers in the ducts that served the two-story zone and thus forced the flow of warm air to the one-story zone.

When summer came and the refrigerating system was started, the owner again was not pleased. The damper adjustments that had served for balancing the warm air delivery no longer accomplished results when the much heavier refrigerated air was employed. The wide open dampers for the one-story zone caused far too much cool air to go to that zone and the throttled down dampers for the two-story zone permitted practically no air to rise reluctantly to the overheated top story rooms. It became necessary then, at every major change in the outdoor temperature, to readjust all the dampers. There are at least 10 dampers, many very difficult of access and that must be changed to different settings, not only for winter versus summer, but also to deal with every sudden change in the outdoor temperature, such as we meet frequently in May and in October.

The complaints by the owner soon exhausted the patience of the contractor. The owner, of course, should have been dissuaded before the building was built from requiring this limited type of design. I tell this tale hoping to prevent other owners or contractors from falling into such a pit.

Possible fences around the pit might have been to employ two separate plants, each with its own fan and ducts and heat transmitter. Another would have been to use a separate air supply duct to each room, these ducts radiating from the furnace, but each having a separate damper that opens or closes in response to the requirement of a thermostat in each room. This scheme would have involved a higher investment cost, but oh! what it would have saved in comfort and possibly in health of the owner and occupants and surely in friendships now broken between the owner and the architect and the contractor!

As it stands, the owner must pay an expert, with instruments, to rebalance the air distribution at least twice every year, or must have the air supply ducts replaced. This would not be easy for those ducts that are buried in the ground. Following this, he must expend, in automatic temperature control equipment nearly as many dollars as he invested in the original plant.

SAMUEL R. LEWIS, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping and air conditioning problems.

Big Building

Air conditioned printing plant, left, is typical of many process air conditioning installations in such industries as textile, photographic, electronic, and others. However, with so many other industries just beginning to think about air conditioning, it is estimated that all industry is less than 1 percent saturated as far as air conditioning is concerned. Air conditioning of a large percentage of modern production facilities is seen as inevitable because of factors of competition in the industrial as well as in other fields. Market studies of the entire large air conditioning field indicate that the industrial has the greatest potential.

NEARLY $10 billion worth of large air conditioning systems will be installed in the next 10 years, according to Charles V. Fenn, vice president of Carrier Corp. And of the various types of installations, those for industrial plants are expected eventually to lead all the others, he declared.

In terms of overall dollar volume in the large air conditioning field, about three-fourths of the total is accounted for by new office buildings, existing office buildings, hotels, hospitals, apartment houses, laboratories, department stores, shopping centers, and industrial air conditioning. The remaining one-fourth comprises all other types of buildings.

New Office Buildings Third

It is surprising to note that new office building air conditioning stands in about third place. However, it has played a far more important role than its relative position might indicate. Virtually every major office building constructed since World War II has included complete air conditioning. Mr. Fenn reported that more than 60 new air conditioned office buildings have been erected in New York City alone since World War II.

The owners of older office buildings in New York City and in other areas, too, after World War II had no problems in filling the buildings at rates which were economically satisfying. But suddenly a vast amount of modern, extremely desirable office space was created next door or in the same area. Immediately the tenants found space available which was more modern because it was air conditioned. The problem of facing a prospective reduction in "Class A" tenants or begin a modernization program which would include air conditioning had to be solved.

Market "Opens" at 18 Percent

The largest single category of new business during 1955 was in existing office buildings. It accounted for more than one-third of the total orders booked. It is interesting to break this particular market down city by city, because certain common principles have developed.

Let's look at Dallas or Houston, for example. Here the saturation is literally 100 percent, and there is no business in the air conditioning of existing office buildings. The office building market is solely in new construction and there is, of course, a great deal of this.

But Dallas and Houston a decade ago presented a different story. As each new building went up — fully air conditioned — the old ones were forced to follow and soon they were all done.

It has become fairly well established that, when 18 to 20 percent of the "Class A" office space has been air conditioned — and this point is reached mainly as a result of the construction of new air conditioned buildings — then all remaining buildings in the city must sooner or later air condition in order to maintain their status as "Class A" space.

"We have seen this principle work in New York City in the past two or three years," he said. Within this time, saturation reached the 18 to 20 percent mark. Today the market has broken wide open in the air conditioning of existing buildings. Saturation has already reached upwards of 22 percent, and it is "inevitable" that every single building which expects to retain its top-flight position will install complete air conditioning, he said.

In Philadelphia, the saturation is now at about 18 percent. Surveys show Chicago is at 17 percent, and Cincinnati is just about reaching the point where buildings will be forced to join the parade.

Air Conditioning to Boom

. . . industrial air conditioning market the greatest

From a study of these cities in various geographical areas and climates, the air conditioning of every major office building in the nation is "simply inevitable" over a period of years. It may require a decade — or even longer. However, the pace will increase due to the operation of this saturation principle. This is merely an expression of the competitive nature of the American business system as it applies to rental structures.

Today in this country there is something on the order of 600 to 700 million sq ft of "Class A" office building space, including commercial, owner-occupied, federal, state, and municipal, he said. Applying an arbitrary cost per square foot for air conditioning and reducing this some to account for the proportion of such buildings which may be allowed to become obsolete, the potential market still to come in the field of existing office buildings amounts to the staggering sum of $3 billion.

What About Apartment Houses?

Now let's look at the market for apartment house air conditioning.

Roughly one-eighth of the existing dwelling units in the country are in apartment houses. Apartment house space, like office building space and perhaps even more so, was tight immediately after the war, but there has been a tremendous amount of apartment building construction in this past decade. Now the competitive system which forces one owner to do what the other one does, is beginning to apply air conditioning to apartment houses also.

The man who builds an apartment house today must look ahead and provide the modern features which will make his investment competitive for years to come. In 1955 an increased interest was shown in the complete air conditioning of new apartment structures. It seems certain that, similar to the new office building field, the time will come very soon when all major new apartment buildings are air conditioned throughout, he indicated.

Hospital Volume Is Fifth

Let us look at hospitals next. Since a hospital is for people who are suffering from illness, accident, or surgery, it is essential that the best possible care be given them. This includes control of climate so that the patient will not have to fight the weather while attempting to recover.

Today well over half the hospitals in the country have air conditioning in some form in some area. However, not until 1949 did the air conditioning of a large number of patients' rooms get under way. Today, hospitals are in fifth place in total air conditioning orders booked, Mr. Fenn reported.

Hotel Market Is Huge

Until the last few years there has been virtually no major hotel construction since the beginning of the depression. But just recently a number of new hotels have been built — all air conditioned — a substantial percentage of them by the Hilton chain.

The traveller wants and deserves comfort. The traveller is demanding comfort, and the complete air conditioning of all major hotels everywhere is just as "inevitable" as the air conditioning of office buildings. And it will go — when it goes — just as fast, he said.

In this country there are more than 600 hotels, with 300 rooms or more, exclusive of resort hotels, and it is difficult to say how many there are with less than 300 rooms. It is assumed that the available business in this market is almost $1½ billion, he indicated.

Shopping Centers are Second

Next, let us move to department stores and shopping centers. The suburban shopping center is in essence a smaller version of the metropolitan downtown shopping district with a wide diversity of stores and facilities. In some cases, it is even difficult to think of it as smaller at all. For instance, the Northland Center in Detroit is one of the world's largest shopping centers. It cost more than $25 million to build. The buildings themselves provide nearly 1½ million sq ft of space — or more than 26 acres. In addition, there are some 60 acres of paved parking area — probably the largest parking lot in the world. Every building is completely air conditioned with about 4000 tons of capacity. (See article, *Big New Shopping Center*, by Joseph B. Oliveri in September 1953 HPAC, pp. 102-106.)

Obviously no owner of a large downtown store is going to let business depart through failure to provide equally modern facilities. Therefore, a substantial volume of modernization in downtown stores has resulted because of this trend. Mr. Fenn said that today such installations represent the second largest category of the large air conditioning business.

Greatest Market Is Industrial

Let us explore the potential of "the most exciting market of all" — the industrial plant.

Consider the tremendous amount of office building space in New York, Chicago, Cleveland, Pittsburgh, and

WORLD'S BIGGEST AIR CONDITIONER will be even bigger with the addition of another centrifugal cooling machine to its plant. The installation, in the Merchandise Mart, Chicago, is the word's largest for a commercial office building. This will complete the 20 yr step-by-step air conditioning program largely planned and executed by W. A. Stahl, left, operating manager of the building, and W. S. Bodinus, Chicago district manager for Carrier Corp. Total cooling capacity of the plant will be 8500 tons

Philadelphia. How many square feet of industrial space do you think there is in comparison? It is estimated that there is between 25 and 50 sq ft of factory space for every square foot of office space, Mr. Fenn said.

But that's not the whole story. Manufacturing plants inherently house heat-making equipment, primarily motors used for driving the mechanical equipment and, of course, in many plants because of welding processes, open flames, resistance heating, or something else where great quantities of heat are liberated.

For example, in a textile plant, in the spinning or twisting area, the heat load to be absorbed by air conditioning is roughly 5¼ times per sq ft what it is in a typical office building. In a weave room, where the yarn is made into cloth, the load is approximately 2¼ times as much. In other areas of the textile plant, the machinery and lights make the load approximately 3 to 3½ times as much as would exist in an office building, and "it is my very best guess that all industrial plants might average out so that the load is somewhere between 2 and 2½ times as much per sq ft of area," he said.

In this area, the cost of air conditioning probably varies more directly in accordance with the load requirement than by any other means. It is easy to see then, the perfectly terrific ratio that exists in the industrial market as compared to that represented by all office building structures. As a starting point, the total existing office building market, including buildings already conditioned as well as those yet to be conditioned, is $3.5 billion. How much larger is the industrial market, represented by dollars? "It is absolutely enormous," he said.

Here are a few figures from one particular industry — the textile industry — which might give you some idea of the saturation that exists today in connection with the industrial market.

A few years ago a textile mill was air conditioned which was referred to as an 18,000 spindle mill. The mill was completely integrated from spinning and twisting, right down through weaving, inspection, and shipping. This mill required 1200 tons of refrigeration to do the entire job.

Currently there exists in the U. S. approximately 18,000,000 total spindles in the industry. Based upon these figures, 1,200,000 tons would be required if 100 percent of the industry added air conditioning to their plants. Only approximately 100,000 tons of refrigeration capacity have been installed in this industry to date, which means that the market is perhaps 8 percent to 10 percent saturated. And the textile market is one of the most air conditioned of all, since this industry has almost always had some degree of air conditioning and has been actively adding to its systems since 1945.

With so many other industries just beginning to think about air conditioning, Mr. Fenn said that it is probably safe to assume that all industry is probably less than 1 percent saturated as far as air conditioning is concerned.

We are living in a modern competitive system, and the factors of competition operate in a factory just as they do in the office building, the apartment house, the hotel, and the shopping center. It is inevitable that in time a very large percentage of the modern production facilities in this country will incorporate complete or partial air conditioning. This makes it "the largest potential with which we have to deal," he said.

Why Are So Few Plants A.C.?

Why is the present saturation of air conditioning in industrial plants still so small? Mr. Fenn answered this by stating that it costs more money to air condition an industrial plant than any of the other types of structures mentioned, because of the greater heat loads which exist.

Also, there is an inertia problem — the need to be convinced — which has been evident in the history of each of the other markets and which has always broken down at some point as explained. Why will this market open? Here are a few examples.

... $600 million of large air conditioning seen for 1956

A. C. Improves Morale

During the war only a few textile plants were built. Excelsior Mills in Clemson, S. C., produced rayon tire cord and the heat loads were so terrific that the addition of air conditioning was obviously necessary. The mill is operating very successfully today with this system.

Skilled help was very difficult to get immediately after the war. This plant, however, not only had all the skilled help it wanted, which was the pick of the crop, but also there was a list of equally skilled help waiting for an opportunity to go to work in the plant. The mill manager reported in unequivocal terms that this waiting list existed because people in that part of the country knew the mill was air conditioned and that year 'round temperatures were comfortable and always the same. Obviously, people left that plant at night less tired than they would if they worked in some other plant without the benefit of air conditioning.

That was 10 years ago, and many textile plants have added air conditioning in that period of time.

And now to bring you completely up to date, here is a story about Sylvania Electric Products, Inc., and their plant in Huntington, W. Va. An air conditioning system involving an exceedingly large expenditure was placed in operation in the mid-summer of 1955. A report has been received which says that although it is too early to obtain measured results from this installation, it can be said that it is definitely a major improvement, according to R. L. Synder, plant manager.

"It is known that morale will be maintained during the warm summer months, and it is anticipated that substantial savings will be realized," Mr. Snyder said.

It was also reported that they had remarkably low absenteeism in August and that practically every worker physically able to get to the plant was on hand during the month. This compares to past experience when during hot weather high absenteeism has been encountered and any number of excuses relative to the absence given, Mr. Fenn said.

Re-work Reduced 25 Percent

Next, let's talk about the Elgin National Watch Co. They found that after they added air conditioning, their re-work decreased 25 percent and employee efficiency was also increased, he reported.

People prefer to work in air conditioned enclosures — and this refers to their homes, their office buildings, or to the plant in which they make their living. Is it not reasonable to expect then that through the years more and more demands will be made by employees all over asking for air conditioning and eventually getting it? Or, as, bit by bit, evidence piles up that it is economically sound for management to install air conditioning, based on the end results achieved from a standpoint of efficiency and cost, is it not sensible to assume that air conditioning will be added?

Air Conditioning Costs Low

The actual cost of air conditioning turns out, generally, to be relatively low when reduced to the cost per piece produced, or the cost per hour, or the cost per person.

Most hosiery plants are air conditioned and have been for years, with a very substantial number being done after World War II. Actual figures in this industry show that the owning and operating costs of a hosiery plant when related to one pair of the finished product, amount to one-third of one cent per pair, or three mills per pair. This assumes production on a two-shift basis and a reasonable amount of down time. Also an analysis of at least one job showed, due to less maintenance on machines, less down time, etc., savings per year of up to 80 percent of the total investment required to install air conditioning in the first place. These figures are, of course, fantastic, but is it any wonder that with figures like this available, almost all hosiery plants are today air conditioned?

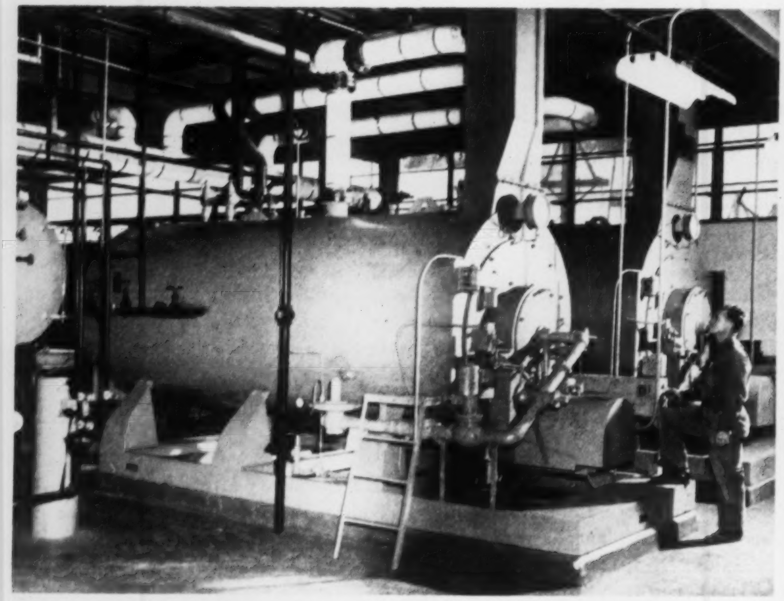
Figures are also available on the cost of air conditioning per employee in an office building and the increase in efficiency that is necessary in order to pay off this cost. Mr. Fenn reported that the average annual owning and operating cost of air conditioning in an office building of $60 to $70 per employee. Assuming an average salary level of approximately $4500, the increase in employee efficiency to offset this cost is only 1.3 percent to 1.6 percent.

The figures are difficult to believe, but nevertheless can be completely substantiated. Many people are hard to convince that such an analysis is correct, but how can there be any doubt that year 'round efficiency of people will be increased substantially more than the percentage given, by the addition of year 'round air conditioning?

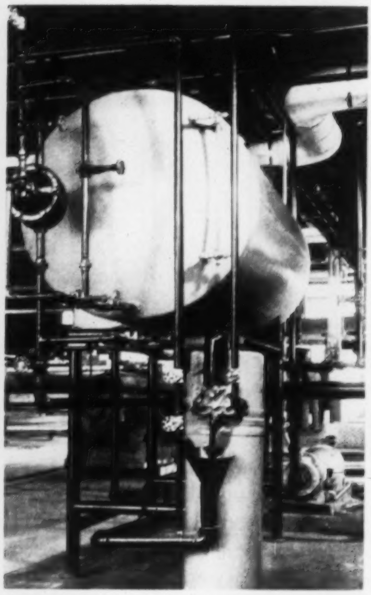
It should be completely self-evident that in these highly competitive days, it is absolutely inevitable that the modern industrial plant with the ever-increasing problem of producing goods at lower costs than its competitors, will be air conditioned. And not only will this air conditioning be in the plants, it will be in the offices which serve the plant and in the office buildings that service the product through sales, with all of its ramifications, in all of our big cities.

Future Predictions Are Bright

"I would like to risk a prediction on the growth of the large air conditioning business. Over the next 10 years, in this field, (systems ranging from 100 tons up) the industry will do a retail volume totalling about $10 billion. The 1956 volume will be about $600 million. The total volume in 1960, five years hence will be about $850 million. In 1965 it will have grown to $1.3 billion," said Mr. Fenn. ‡



GAS FIRED STEAM GENERATORS—150 hp at left and 250 hp at right—operate at 90 psi. Careful daily maintenance and operating records are kept on this plant



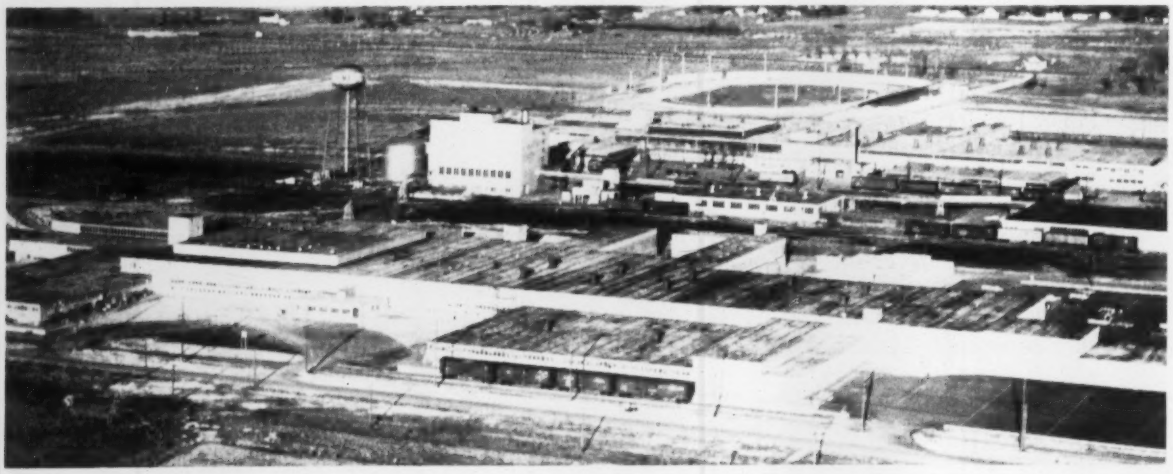
CONDENSATE RETURN SYSTEM includes 500 gal condensate tank, above, and water softener

Two Package Boilers Save $5870.96

. . . during first heating season in 10½ acre plant despite higher steam load and colder weather

By Joseph Rich

Operations Superintendent
Zion Cooperative Mercantile Institute



PLANT of Zion Mercantile Institute in Salt Lake City covers 10½ acres. Additional steam load included heat to keep new 500,000 gal water tank, at foot of tower, from freezing

THE INSTALLATION of two package gas fired steam generators saved $5870.96 during the first year of operation at the Zion Cooperative Mercantile Institute, Salt Lake City, Utah. This saving was made despite a heavy increased steam load and an unusually severe winter. The capacity of one of the boilers is 250 hp and that of the other is 150 hp. Both operate at 90 psi.

During the previous heating season — 5844 deg days — the steam bill was $20,592.73 for just the warehouse building, with 10½ acres of floor area. With the installation of the two boilers in a corner of the steel warehouse, a new 500,000 gal water tank and pump house was added to the steam load. (Temperatures must be kept above freezing in the water tank for fire protection.) Despite a winter of 6371 deg days, heating costs dropped to $14,721.77.

Although it was estimated that a minimum of 600 hp was needed, institute engineers upon analyzing steam meter readings decided that less than 600 hp was actually needed. From the beginning of the season until about December 1, 150 hp carries the entire heating load. After that, 250 hp carries the entire load as long as the temperature remains above freezing. Once the temperature falls below freezing, more than 250 hp is needed for heating and to keep the water tank from freezing.

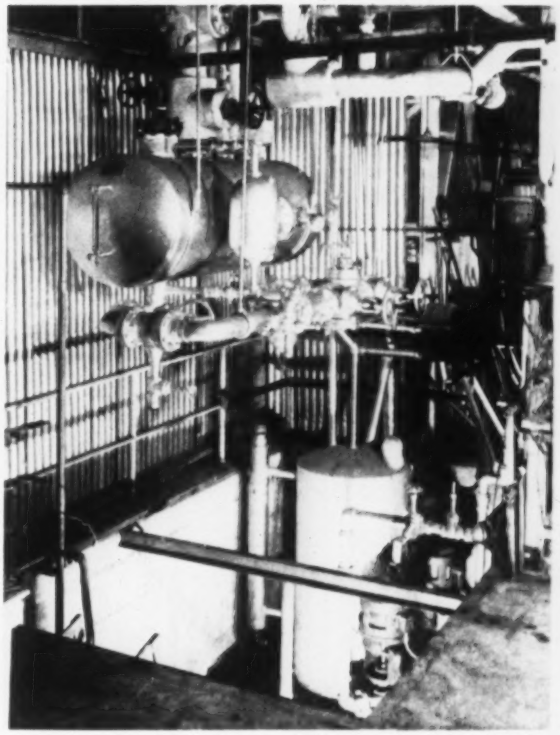
Working temperatures in the warehouse and office areas are maintained with about two-thirds the recommended steam capacity. One reason is that heat from work areas on the mezzanine, which extends over one-third of the building area, spills over to keep the rest of the plant warm. Wherever doors must be open most of the time — shipping and receiving docks, for example — unit heaters blast heat at openings to keep cold air out.

In periods of fluctuating temperatures, No. 1 boiler — 150 hp — automatically cuts out. No. 2 cuts in on the heating mains when steam demand exceeds the capacity of the smaller unit. Constant steam pressure readings are recorded at a station 1100 ft from the boilers. The longest steam line is 1700 ft. Despite the large area heated, heat can be distributed throughout the system within 40 minutes of firing the boilers.

Make-up water is about 11 percent. Condensate is gravity fed to a central point in the plant, then pumped back to the boiler condensate system. This return system is a remnant of the days when the institute purchased steam and condensate was returned to an outside plant.

Water softeners, feed pumps, and condensate return pumps all operate automatically. The system includes twin bypass water treatment tanks at the rear of the 500 gal condensate tank. Two condensate pumps are alternated every 30 days, with one on continual standby. ‡

Photos courtesy Cyclotherm Div., National-U.S. Radiator Corp.



CENTRAL CONDENSATE RETURN STATION has flash tank at top, condensate receiver in pit. Steam from flash tank is used in two low pressure heaters in shop

UNIT HEATERS in areas where doors are open blast heat to keep cold air out and protect rest of plant from heat loss

By Milton J. Wiksell

Director,
Business and Professional Speech,
Indiana University

HOW TO MAKE A GOOD SPEECH

• ***Communication through speech making is an important part of nearly every phase of the heating, piping, and air conditioning field. The ability to speak effectively in public is a great asset, if not a requirement today. Therefore, HPAC presents, as a practical contribution, this article by a leading speech authority.***

You have no doubt heard such comments as: "I couldn't quite understand what he meant," "He seemed unenthusiastic," "He was argumentative," "There was something odd about the way he said that," "Would the man please come to the point," "He bores me to death," and so on ad infinitum! These reactions reflect but a few of the common faults of speech.

A study made by Lull, Funk, and Piersol shows that the majority of corporation presidents agree that the effectiveness of management personnel is greatly dependent upon ability in oral communication.

How best can an individual improve this ability?

Plan To Improve Your Speech

First, I would recommend joining a group interested in forming a speech class. There is no substitute for practice before a sympathetic audience, and that you have in the average speech class. In addition to practicing before a stimulating group, you have the advice of a professional speech teacher. Without such supervision, your mistakes may develop into fixed habits.

Remember that speech cannot be learned in 20 easy lessons, but that it is something you must constantly improve upon from the cradle to the grave. So don't expect an immediate transformation in your speech habits.

Things You Can Do

If you are concerned with improving your speech, consider continuation classes in speech and seize every opportunity, no matter how insignificant, to speak to others. This means putting into practice in your daily conversations, interviews, telephone calls, business meetings, and conferences what your instructor has advised you to do.

Individual coaching has proved highly successful in the annual Graduate Savings and Loan Institute held each summer at Indiana university. Here speech teachers meet with every senior for one hour to evaluate his speaking. In addition to this special assistance, the program recommends that all students take two classes in speech during their other two summer sessions.

Or you might explore the following:

1) The purchase of an inexpensive tape recorder with which to analyze your own speech.

2) The purchase of a speech book and subscription to a speech magazine which are written by well qualified academic authorities.

3) Speaking as often as you can before groups of people and requesting their evaluations.

You Become More Efficient

But you say you are not especially interested in public speaking and may never have to give a formal speech. But you never know! Even so, the principles taught you in speech courses have a direct bearing on conversation, discussion, clarity of thought, giving instructions, conference procedure, interviewing, persuasive announcements, telephone calls, and even written communications!

No business or professional man can function at his fullest capacity with inferior speech habits. This is as true for those who are engaged in administrative duties as it is for the employees. The kind of speaking both do can make an enormous difference in selling services and products and in making for efficiency and good will.

What Makes a Good Speech?

What are some basic requisites of good speech? I cannot list them all here, but foremost is the ability to get your point across in an appropriate manner. If, when you have finished speaking, your listener has the feeling that he understands, that he is moved to do something, that he is convinced or stimulated, and that he is very much interested and sold on your plans, you are on the right track!

How can you make a more convincing speech? First, the choice of the specific phase of a subject must be of special interest to your audience. Secondly, you should have many direct experiences with your speech topic, as well as much source material.

Consider in planning your discourse that we are often, as Woodrow Wilson said, guided more by the emotional than by the logical appeal. As human beings, we are prone to look with interest upon such human wants as self preservation, security, savings, health, justice, well being, time and labor saving devices, pride of ownership, and many other such desires. Appeal to these factors of human concern and almost anyone will take notice.

Your speech — which should be brief — must have numerous logical ideas, for we also deal with the intellect. After several years of teaching oral English to engineers in an eastern university, I came to the conclusion that reducing technical material to the layman's comprehension was their biggest hurdle. Therefore, make use of concrete examples, simplicity in language, simplified statistics, round numbers, restatement, rhetorical questions, reasoning, authoritative quotations, and personal illustrations. A liberal sprinkling of the latter two items will do much to carry the speech.

25 POINTS TO REMEMBER

Preparation:

1 Choose a specific phase of a subject of special interest to your audience.
2 Be sure you have had direct experience with your subject.
3 Collect more raw material than you can use.
4 Organize the material in two or three main divisions so that the structure is strong. Start with the strongest division.
5 Open with interest, close with satisfaction.
6 Appeal to human wants and concerns.
7 Include numerous logical ideas.
8 Use concrete examples.
9 Use simplicity in language.
10 Use simplified statistics.
11 Use repetition.
12 Use rhetorical questions.
13 Use logical reasoning.
14 Use authoritative quotations.
15 Use personal illustrations.
16 Use adequate visual aids.
17 Be brief.

Delivery:

18 Practice aloud over and over.
19 Don't mumble, race, or drag.
20 Vary tone, pitch, rate, and volume.
21 Work to improve your faults.
22 Use proper gestures.
23 Use small note cards; gaze directly at audience.
24 Gear your delivery to size of the room, nature of the meeting.
25 Be friendly, act natural, smile.

Use Numerous Visual Aids

I do not believe there is a better way to explain a project than to supply the listeners with numerous visual aids. If we accept the statement, "seeing is believing," then surely we ought to utilize every means to appeal to the sense of sight. The possibilities are numerous. Included are actual objects, demonstrations, models, films, slides, maps, pictures, documents, blackboard, charts, and other graphic material.

In more recent times, startling effects have been achieved by using the flannel board, flip charts, and strip boards upon which blank papers are torn off to reveal the material as the speaker approaches that particular point. Perhaps the most elaborate method is a system of charts which are made to come into view by push button.

Many times, these useful forms of visual illustrations are lacking. Too often, also, only one visual aid is used when more could strengthen the presentation. The most impressive speech I ever heard an engineering student deliver was over 15 years ago. He made use of many of the above mentioned visual aids. Since that time, I have heard thousands of speeches in my classes and elsewhere, and obviously if I can remember this particular one, it must have been outstanding.

Visual devices are an effective means to hold interest and increase understanding. But they must be employed properly. Above all, plan to display charts, drawings, or pictures that are large enough to be seen at a distance. Dark colors are better than light ones to represent areas, lines, or printed commentary.

Secondly, present attractive visual aids and place them in front and center on a rack high enough so that everyone can see. You'd be surprised how often speakers place the chart far to one side or tape it to the front table.

A common error is to become so engrossed with the visual materials that the interests of the audience are overlooked. I have often observed the speaker facing and addressing his "conversation" to the pictured materials. Besides blocking the view of many in the audience, the speaker loses the opportunity to project his remarks and maintain proper audience contact.

To overcome these mistakes, a pointer stick is useful to indicate the exact object under consideration and avoid obstructing the view.

Study the visual aids carefully before giving the speech. Figures or other data on the charts will then be so well in mind that, with the exception of a few swift glances, you can continue concentrating on the audience.

• organize your speech carefully

In preparing a speech, be careful not to overlook the ethical aspects. People want to believe in you, want to be shown, and expect sound statements of fact. If there are any weaknesses or doubtful items in your case, you should be prepared to admit them. You could then counter with more advantages for your viewpoint and thus compensate for any deficiencies.

It is obvious that much more material than you'll ever need should be at your command. If you do not have the time to say all that you intended, you'll please the audience by giving them the impression that you could have said much more.

Start with Strongest Idea

After collecting the raw materials from various recognized sources for your speech, there remains the problem of organization. A speech or conversation which is structurally weak is incoherent, and the purpose of the discourse may be lost. Do as the late Franklin D. Roosevelt, a master speaker, did — pick the issues which stand out and use them as your chief line of attack.

Choose the most potent one from the two or three main divisions of thought (more would likely confuse and bore the audience) and present it as your first issue. A vital point at the beginning of the body of your speech grips the listener, and you can repeat it for effect, as Churchill strongly recommends.

Also keep in mind that enumerating these issues in the speech helps to clarify the various ideas and keeps the whole structure in proper focus. Perhaps this advice sounds like hard work — and it is. But this is the path to effective speaking.

After the body of the speech has been planned, the opening and closing remarks may be formulated. In most instances it is advisable not to blurt into your subject immediately. Otherwise, you would find your best salesman asking you to buy his product in his opening comment.

Brief and tactful references of an impromptu or "on the spur of the moment" nature relative to something which has just occurred pleases the audience. You may refer to the reason for the discussion. The introduction of rhetorical questions which lead up to your topic is an excellent attention getting device. Humorous remarks relating to the speech topic may be used if they are in good taste. You are speaking to win favorable responses, so be certain no remarks have cause to offend.

Following your attention getting material, you must plan to state clearly and concisely your topic for discussion. Here you can point it up by utilizing a slower rate and an increased volume. The importance of emphasizing your topic cannot be overestimated. In many of my own executive speech classes, student evaluations have revealed differences of opinion as to the specific purpose of the speaker! I strongly recommend the repetition or restatement of this key purpose several times in the speech to keep the listeners oriented. Leave no doubt at any time as to your objective.

In preparing your concluding statements, be aware of the fact that you can tie up loose ends here by simply summarizing the whole speech. Better yet is a brief restatement of the ideas in different terminology.

A straightforward appeal to the future application of the solution to your problem, or for action, belief, and understanding are other ways to bring the speech to a close. In the formal types of address, use poems, dramatized illustrations, epitomes, and quotations.

Your speech is now planned, but we must not overlook the delivery of it. Very few people tolerate canned speeches or those which are read aloud. I have in mind recent critical remarks at an Institute which went like these: "Why does Mr. H. 'read' his paper every year? He is good, but the reading is rotten." Another wrote this evaluation: "I was disappointed to see so many papers read instead of delivered from notes."

Practicing aloud in your room to avoid such disastrous effects will make for a better presentation. People expect

I do not dislike the matter, but the manner of his speech.
Shakespeare

When we make ourselves understood, we always speak well.
Moliere

Suit the action to the word, the word to the action.
Shakespeare

Speak clearly if you speak at all;
Carve every word before you let it fall.
O. W. Holmes

Even the most timid man can deliver a bold speech.
Seneca

Why did I blab?
Shakespeare

What is the short meaning of this long harangue?
Schiller

Speech was made to open man to man, and not to hide him; to promote commerce, and not betray it.
David Lloyd

a direct gaze, so go over your speech again and again extemporaneously. If you need exactitude, you can quote verbatim if the passage is short. But you must do so in a conversational way looking up from the printed page as often as possible. For the rest of your speech, plan to use small 3 × 5 cards for easy reference to key phrases.

Don't Mumble, Race, or Drag

Often, a man knows his subject thoroughly but fails miserably in putting it across. In your practice sessions rely heavily on the use of a tape recorder. Ask someone to evaluate your performance. Even if this person doesn't know all the speech techniques, you and he will spot many weaknesses as you listen to the playbacks.

Therefore, be careful to utter the sounds so that what you say may be readily understood. This means the energetic and flexible use of the lips, teeth, tongue, and jaws.

Next, keep in mind that variation of tone, pitch, rate, and volume make it possible to convey more meaning and arouse more interest. If a person fails in these aspects of delivery, he runs the risk of being a bore!

Work to Improve Your Faults

Let us suppose that you have a slow, tiresome rate of speech. For this particular fault, I would advise that you make a determined effort to speak doubly fast in daily conversation. You'll be amazed what this consistent effort can do for your speech.

If you have no volume changes in your speech, pick out the salient features of your discourse and speak them with some increase in force.

You can do something for a monotone by attempting to project your own feelings as you say something. If you are pleased, show it in your tone of voice.

Cultivate Gestures

A second phase of delivery deals with bodily action. The adage, actions speak louder than words, still holds true, so in general cultivate the proper visible impressions.

I believe it pays dividends to show enthusiasm in your facial expressions and actions. A friend of mine in Maryland once told me that his success in the professional world greatly depended on the good will of his fellow men. He attributed much of his achievement to his own friendliness with people. "It doesn't cost anything to smile," he once said. Another friend told me that he is exposed to numerous problems brought to him by his subordinates, colleagues and others. It seems appreciated, he notices, if he displays a sympathetic and tactful attitude in return, instead of mere nonchalance.

Likewise, audiences expect you to reveal in your face and actions how you, personally, feel about your subject. If you fail here, you are contradicting yourself.

Put On Some Steam

You might wonder how much spontaneity, animation, and projection to use. This depends on the size of the room and the nature of the meeting or the communication. Ordinarily, many people are sadly lacking in this department. I have heard such a reaction as, "Can't the man be much more aggressive and energetic in his style?" So, you see, it is expected of you to put forth some steam. Some may look upon those who do this as natural born speakers, gifted in the art. But Hoyt Kelley, one of the best speakers I ever helped train in my business and professional speech courses, informed me that when he is finished giving a speech—and he gives numerous ones in California—he is more exhausted than if he had played a game of football! And his colleagues thought it looked so easy!

If, when you have finished these methods of planning a speech, you feel apprehensive about giving it before the board meeting, or any other audience, remember that fear is a normal occurrence among even the top-notch speakers. Some have said that you don't deliver a good speech without it. The best way to ease the feeling is thorough preparation and speaking as often as you can before others. Act natural. Be yourself. Then, by appearing to enjoy the speech, you can be effective! ✠

19 Zone, Double Duct System Conditions Underground Offices

Year 'round air conditioning is required in this IBM machine accounting department because of high heat loads. Each room — with widely varying adjacent loads — is a separate zone, independently heated and cooled.

1 MACHINE GALLERY, part of 200 by 35 ft IBM below-grade court, has a light heating load but a heavy design cooling load. Large changes in load occur when machines are stopped or started

By John E. Leary
Mechanical Engineer
C. F. Braun & Co.

2 ADJACENT BUILDINGS are joined on basement level by underground office areas called courts

SOME 900 air conditioned and sound proofed offices, occupying 12 buildings, constitute the Alhambra, Calif., headquarters of C. F. Braun & Co., worldwide engineering organization. From the air, the buildings appear as separate structures, but they are connected on the basement level by underground office areas called courts. There's an independent air conditioning plant for each building and court.

One such court houses the firm's machine accounting section. A main gallery in the IBM court provides space for 20 accounting and tabulating machines. Four clerical offices and four keypunch offices adjoin the machine gallery. Six more offices are used for clerical work. A large vault and storage room are used for files and supplies.

Overall, the IBM court is 200 by 35 ft, 7000 sq ft of air conditioned space. The entire structure is below ground level. The floor is at the same level as the basement offices of the two adjacent buildings. The reinforced concrete roof slab is topped with asphalt paving.

Heating Load Is Light

The air conditioning system is designed to maintain 72 F and 50 percent relative humidity throughout the court year 'round. The outside design conditions are 28 F for winter and 100 F for summer. Because of heated spaces on either side of the court, the heating load is light — only 175,000 Btu per hr. The design cooling load, on the other hand, is heavy — 350,000 Btu per hr — of which 25 percent is chargeable to heat dissipated by the various accounting machines.

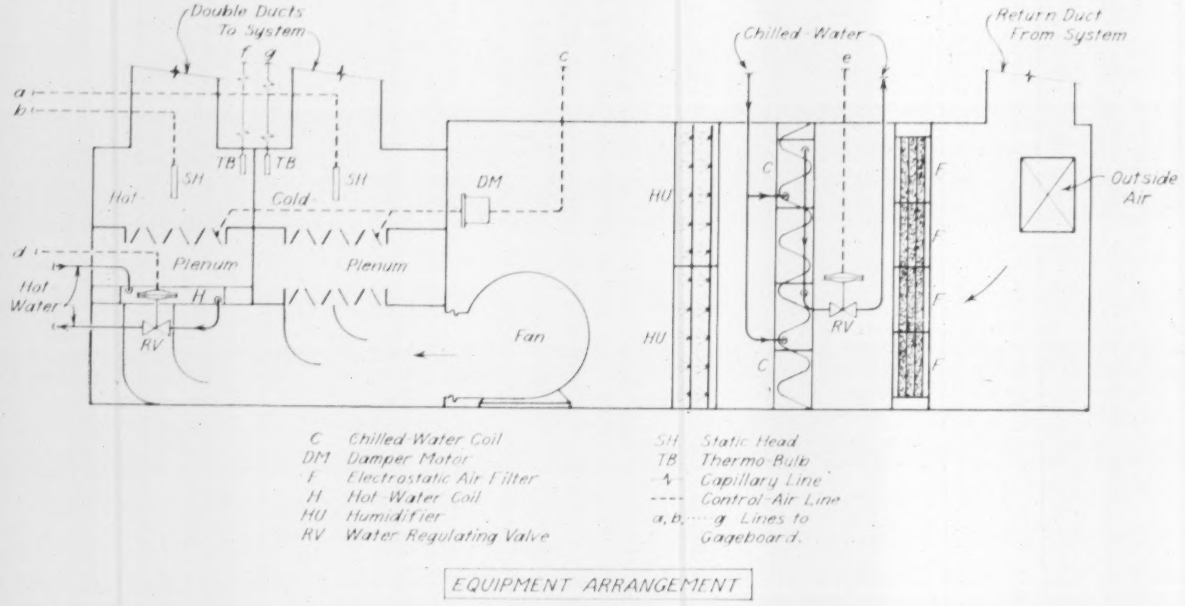
The heat load caused by the accounting machines makes their use factor — frequency and duration of operation — highly significant to the design of the system. Large changes in load occur when machines are stopped or started, or when additional machines are moved into a space. This is particularly critical in the keypunch offices. The maximum cooling load nearly doubles in an office when three keypunch machines are put into use. Flexibility of operation requires that any four of eight offices be usable for keypunch work. In addition, the system must provide for future expansion.

Choose Double Duct System

For these purposes, a conventional zone system has several limitations, in my opinion, and was not used for these reasons. The widely varying loads preclude grouping offices into a homogeneous zone. The zone system would supply the same air to all offices in a zone. If one office were used only for general work, the internal heat gain might be 2000 Btu per hr during temperate weather. The office next door, with three keypunch machines running, would have a 4300 Btu per hr load. The zone controls would sense the return air temperature from both offices. The supply air temperature would be regulated to maintain an average of 72 F in the zone. In this instance, the first room would be at 68 F. The room with the machines in use would be at 75 F. Therefore, in this application it was apparent that each room must be a separate zone with its own controls in order to meet the requirements.

The double duct system makes each room an independent zone. Two ducts extend throughout the entire structure. One carries hot air, the other cold. At every room, branch ducts merge into a duct leading to the air outlet. Thermostatically controlled mixing dampers at each room proportion hot and cold air as required to maintain 72 F in the room. Thus, at any one time one room can be heated and, at the same time, another room can be cooled. Furthermore, if the IBM machines are moved from room to room, the control of room air temperatures will not be disturbed. In addition, the individual room controls give occupants of each space a liberal range of independent temperature selections.

how system operates is shown on next page


Double Ducts To System
f
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Outside Air
Plenum
Plenum
Hot Water
H
RV
Fan
HU
C
RV
F
F
F
C Chilled Water Coil
DM Damper Motor
F Electrostatic Air Filter
H Hot Water Coil
HU Humidifier
RV Water Regulating Valve
SH Static Head
TB Thermo-Bulb
Capillary Line
---- Control-Air Line
a, b, ···· g Lines to Gageboard.
EQUIPMENT ARRANGEMENT

3 AIR CONDITIONING EQUIPMENT is housed in a sheet metal plenum, which is 8½ ft square and which extends the length of the equipment room. Double ducts take off from the tops of the hot and cold plenums and branch out to 19 separate zones

• system provides air change every five minutes

The equipment arrangement is shown in Fig. 3. The 30 by 14 ft equipment room is outside the court in the basement of one of the adjacent buildings. It is centrally located, lengthwise to the court. Holes cut in the separating 12 in. concrete wall connect the ductwork in the court to the equipment.

A sheet metal plenum, the length of the equipment room and 8½ ft square, houses the air conditioning equipment. At the inlet end, 77 percent return air is mixed with 23 percent outside air. The mixture of these air streams passes in turn through air filters, cooling coils, humidifiers, and into the supply fan. This fan discharges into the hot and cold plenums. A heating coil in the hot plenum reheats the air up to the controlled hot plenum temperature. Air passing through the cold plenum undergoes no further conditioning after leaving the humidifiers. Air from the top of the hot and cold plenums passes into the double ducts and out into the court.

The air filters are of the electrostatic type. Ionizing wires at 12 kv charge the contaminant particles. The collector element employs both electrostatic and mechanical filtering. Laminated cellulose paper is electrostatically charged at 9 kv. The fibers in the paper act as collecting electrodes, and the paper serves to filter out larger particles mechanically. A static pressure gage indicates the pressure drop across the filters. The paper collecting elements are replaced when this pressure drop reaches 0.5 in. of water gage.

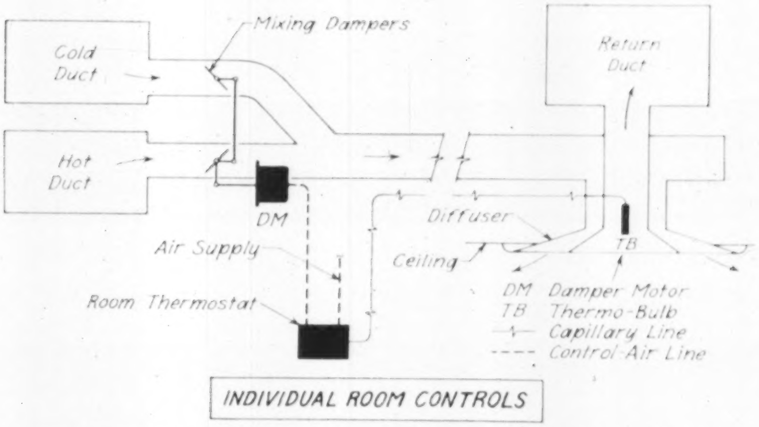
The humidifiers are of the rotating wet screen type. A small motor rotates a cylindrical copper wire screen through a water sump and into the air stream. The water level in the sump is controlled by a float switch operated solenoid valve. The humidifiers provide nearly saturated air at the dry bulb temperature called for by the cold plenum thermostat. Reheating the air in the hot plenum is sensible heating only. The system provides year 'round humidity control.

Chilled water at 45 F and hot water at 160 F are used in the heating and cooling coils. The coils are the finned tube type. The supply fan delivers 13,000 cfm against a static pressure of 2 in. WG. The fan provides a complete air change for the entire court every five minutes.

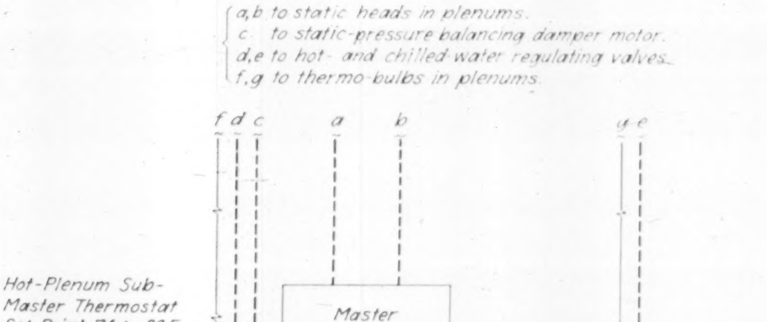
The double ducts branch out from the equipment room to 19 separate zones. Each duct is sized for 75 percent of the combined flow in both ducts. Hot and cold air streams are mixed at each zone by motor operated mixing dampers. One large pair of multiblade mixing dampers serves the IBM room. The remaining 18 smaller zones are equipped with simple quadrant mixing dampers in the hot and cold ducts.

Ceiling mounted diffusers supply air to the rooms at low velocity. Most of the diffusers are dual purpose and serve both for air supply and air return. The return ducts lead back to the equipment room. Twenty-three percent of the return air is exhausted by a small centrifugal fan.

• how controls function


Mixing Dampers
Cold Duct
Hot Duct
Return Duct
DM
Air Supply
Diffuser
Ceiling
TB
Room Thermostat
DM Damper Motor
TB Thermo-Bulb
Capillary Line
Control-Air Line
INDIVIDUAL ROOM CONTROLS

4 ROOM CONTROLS consist of a remote bulb thermostat that senses air in the return duct from each room. A change in room temperature changes the output pressure of the thermostat, causing the damper motor to re-position the mixing dampers


a,b to static heads in plenums.
c. to static-pressure balancing damper motor.
d,e to hot- and chilled-water regulating valves.
f,g to thermo-bulbs in plenums.
f d c
a
b
g e
Hot-Plenum Sub-Master Thermostat Set Point 74 to 83 F
Master Controller (S.P. Regulator)
Set Point 0" Water
Cold-Plenum Sub-Master Thermostat Set Point 52 to 59 F
Man.
Auto.
Man.
Auto.
PS
PS
MRV
MRV
Air Supply
Static-Pressure Balancing Control
Plenum-Temperature Reset Control
MRV Manual Regulating-Valve
PS Pneumatic Selector Switch
Capillary Line
Control-Air Line
PLENUM CONTROLS

5 PLENUM CONTROLS, mounted on a gage board, include a master controller, which is a static pressure regulator. It changes the temperatures in the hot and cold plenums in relation to the average demand throughout the system

There are two major control categories: (1) Controls at each room or zone; (2) Plenum controls, in the equipment room, that act upon all the air passing through the system. Controllers, automatic valves, and damper motors are all pneumatically operated.

As shown in Fig. 4, the room controls consist of a remote bulb thermostat that senses air in the return duct from each room. A change in the room air temperature produces a change in thermostat output pressure. And the damper motor re-positions the mixing dampers until the desired room air temperature is restored.

Plenum Controls Different

The room controls described are fairly common to double duct systems. The plenum controls however, are a departure from the normal. These controls are shown schematically in Fig. 5.

Master Controller. The master controller is a static pressure regulator. It senses any inequality in static pressures between the hot and cold plenums. This inequality is a direct index of the demand for heating or cooling throughout the system. For example, as the system calls for more cooling, the flow of hot air is less than the flow of cold air. And the static pressure in the hot plenum rises with respect to the cold plenum.

Any unbalance in static pressures is transformed into a proportional variation in the master controller output pressure. The varying air pressure actuates two submaster systems: (1) Plenum temperature reset; (2) Static pressure balancing.

Plenum Temperature Re-set. The master controller changes the temperatures in the hot and cold plenums in relation to the average demand throughout the system. Submaster thermostats for each plenum are reset by the master controller for this purpose. For design heating, the

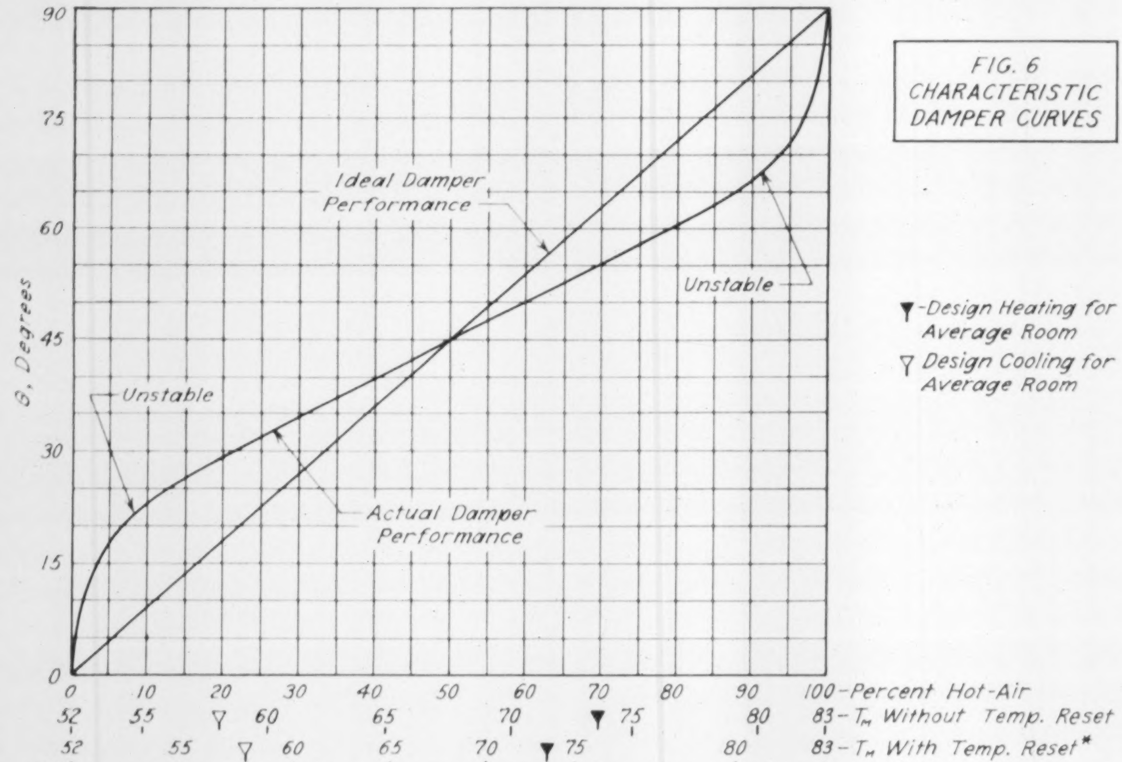


FIG. 6
CHARACTERISTIC DAMPER CURVES

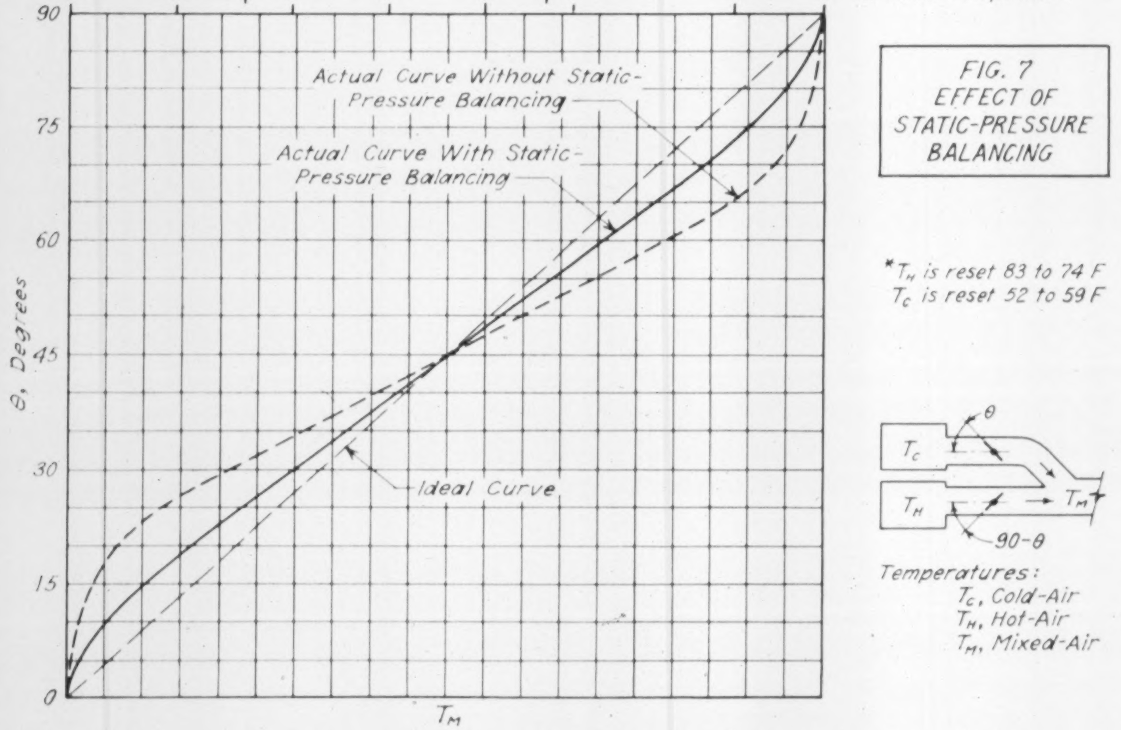


FIG. 7
EFFECT OF STATIC-PRESSURE BALANCING

MIXING-DAMPER PERFORMANCE CURVES
Damper Angle, θ vs. Mixed Air Temperature, T_M

6 MIXING DAMPERS' performance curves indicate a nearly linear relationship between the change in damper position and the change in percentage of each air stream in the resultant mixture

7 STATIC PRESSURE balancing by the two submaster control systems achieves stable operation at extreme mixtures plenum temperatures are 83 F and 59 F. As the demand for cooling increases, the plenum temperatures are gradually reset to 74 F and 52 F to accommodate the design cooling load.

Static Pressure Balancing. The same master controller is used to control a damper motor. This motor operates two opposite acting, multiblade dampers located in each plenum. The dampers are automatically positioned until equal static pressures are obtained at the static heads in each plenum.

Control Objectives. The primary purpose of the two submaster controls is to allow the 19 sets of mixing dampers in the system to operate in the midrange of damper positions. The objective is to avoid extreme positioning where one damper is nearly closed, and its mate is nearly wide open. Three advantages result from operating the dampers in the midpositions: (1) Positive control; (2) Less damper noise; (3) Reserve capacity.

Positive Control. A nearly linear relationship is obtained between the change in damper position and the change in percentage of each air stream in the resultant mixture, as shown in Fig. 6. This minimizes hunting and erratic damper operation that is usually encountered in the extreme mixture conditions and in the extreme damper positions. Also, the total air flow through the dampers is more nearly constant; that is, less variation in room cfm with load changes.

Less Damper Noise. The mixing dampers are only a few feet from the ceiling air outlets. One of these dampers nearly closed is a probable source of whistling. By avoiding extreme damper positions, this noise problem is minimized.

Reserve Capacity. Generally, there is a portion of normally unused damper travel. The capacity of the system can be increased to meet sudden loads by using this portion of the damper travel. For example, if the hot air mixing damper is operating at an open angle of 60 deg during normal heating, it can open another 30 deg in order to meet an unusually heavy heating demand, or for building warmup after a winter shutdown.

Control Effects. The effects of the two submaster control systems are shown in Fig. 7. (1) The plenum temperature re-set moves the required proportions of hot and cold air closer to 50-50 percent at the mixing dampers. (2) The static pressure balancing between the hot and cold plenums allows the mixing dampers to achieve these required proportions with more uniform response to the room thermostat. As a result, there is less unstable operation at extreme mixtures.

• *system serves satisfactorily*

Two pneumatic selector switches in the master controller output line permit the automatic functioning of (1) plenum temperature reset only, (2) static pressure balancing only, or (3) both submaster systems at once. The selector switches were used to test each control individually, with the other control at a manually preset point. No hunting was evident from interaction between the two control systems. The advantages of both the plenum temperature re-set and the static pressure balancing have proven to be additive. The plant is operated with the master controller actuating both systems simultaneously. With a wide variety of loads so far encountered, there have been no observed cases of damper noise or damper motor cycling.

The automatic controls provide continuously smooth operation. There were a few maintenance calls at first. However, once minor adjustments were made, there were no more calls. Some rooms have been set for temperatures different from others. Portable temperature recorders have operated in the rooms over 24 hour periods, during which the load varied considerably. The recorded temperatures indicated extremely close control at the desired points. Although the ventilation rate is much higher than for most office spaces, the noise level is low. In two years of operation, the double duct air conditioning system has proven well suited here. ‡

Clubs Awaken Engineering Interest

. . . among high school students

An organization called Junior Engineering Training for Schools — JETS — is bringing the facts of engineering to a growing number of young people and may help boost America's race with Russia for trained engineers, according to Michigan State university.

Since the first JETS club was organized in the East Lansing high school in 1950, the program has grown to 75 clubs in 18 states, with membership of more than 2000.

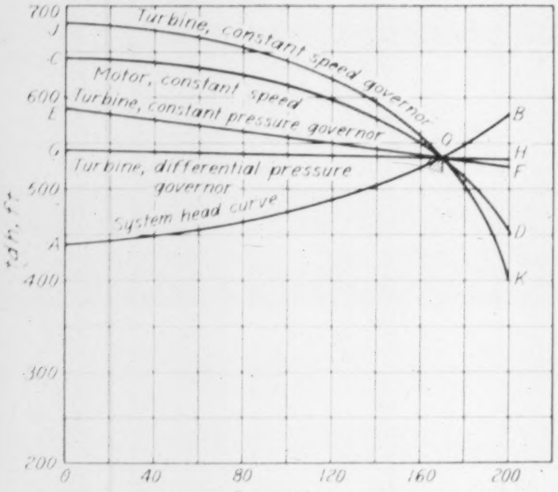
The working idea for JETS started with Lorin G. Miller, former dean of engineering at Michigan State university, now retired.

M.S.U. Prof. Harold P. Skamser, director of the JETS program today, says, "We agreed that the word about engineering was just not getting through to the majority of students in high school who are interested in engineering.

"We feel that in the JETS program high school students can learn at first-hand the real nature of engineering and be able to compare their talents and abilities with the requirements of the profession." ‡

System Head Curve

By Thomas F. Keating
Application Engineer,
Centrifugal Pump Dept.,
De Laval Steam Turbine Co.



3 VARIABLE SPEED DRIVE **affects system head curve according to means of regulation used, as shown here**

THE INHERENT LOSSES due to throttling may be decreased by leaving the system head curve alone and changing pump speed. This can be accomplished by either of two variable speed drives:

1) Steam turbine with constant or differential pressure governor.

2) Hydraulic coupling with constant speed motor. Both of these cut brake horsepower losses by dropping pump speed as load decreases, narrowing the spread between the pump curve and the system head curve.

A Turbine Drive: Controlled Two Ways

A turbine can be equipped with two types of variable speed governors. These are to be differentiated from the constant speed governor normally supplied on all turbines as standard equipment.

1. Constant Pressure Governor Is Simplest

The simplest type of constant pressure governor is a spring loaded diaphragm operator to which an input pressure signal comes from the pump discharge pressure. The output movement of the diaphragm is transmitted by linkage to open or close the steam inlet valves on the turbine. Since the pump total head rises as load decreases, if the pump suction pressure remains constant, pump discharge pressure rises. Hence, upon a pressure rise the diaphragm moves, compressing the spring and closing the turbine inlet valves, which decreases the turbine speed. Theoretically, this should act to maintain a constant discharge pressure.

Actually, the governor is designed to allow a small amount of unadjusted pressure rise as load decreases, in order to attain the stable positioning of the steam inlet valves and, therefore, stable turbine speed. This pressure rise from full capacity to zero capacity on the pump, compared to full load pressure, is called the governor "regulation." It is designated as a percent of total head. Hence, curve *EF*, Fig. 3, showing the actual pump curve with turbine drive under control of a constant pressure governor, rises from point *O* at full load to *E* at shutoff, a regulation of $(E - O)/O$.

Numerically:

$$(589 - 535)/535 = 10 \text{ percent regulation} \quad \ldots\ldots\ldots\ldots [4]$$

Operation can be compared to a constant speed motor driven pump with a 10 percent pressure rise to shutoff; variation in capacity must be obtained by throttling by the regulating valve.

The percent pressure rise or regulation for this type of constant pressure governor will vary, but a range of 8 to 13 percent of total head might be considered normal. However, more sensitive types are available. With a relay type of control, either pneumatic or hydraulic, a regulation of from 1 to 5 percent can be obtained, depending on the total discharge head of the system. Such a small rise would be difficult to duplicate with a motor driven pump without danger of obtaining an unstable drooping characteristic curve at low capacities.

2. Differential Pressure Governor Regulated

The simplest type of differential pressure governor is essentially the same as the constant pressure governor, in that it contains a spring loaded diaphragm operator which is subjected to boiler steam pressure on the spring side of the diaphragm, opposed by pump discharge pressure on the other. Movement of the diaphragm, due to pressure variation, opens or closes—through appropriate linkage—steam inlet valves on the turbine. Since pump discharge pressure must exceed boiler pressure by the amount of the pressure drop at full load through the piping, regulating valve, boiler, heater, economizer, and static head, the spring presets the required differential pressure between the two, to adjust for these pressure drops.

Since the pump total head rises as load decreases, if the pump suction and boiler pressure remain constant, pump discharge pressure rises. Hence, upon a pressure rise the diaphragm moves, compressing the spring and closing the turbine inlet valves, decreasing turbine speed. Theoretically, this acts to maintain a constant discharge pressure. Actually, this governor also has a regulation to insure stable operation. Hence, curve *GH*, Fig. 3, showing the actual pump curve under control of this gover-

Helps Select Boilerfeed Pumps

A graph of the head capacity characteristics of a piping system helps you choose the right pump for the most economical and efficient operating conditions. The construction and use of a system head curve was discussed in a previous article, in the February HPAC. Also discussed were two methods of fluctuating capacity: by varying the system head and by parallel operation of two or more identical pumps. The present article discusses the use of variable speed drive to change pump speed.

nor, rises from point O to point G at shutoff, a regulation of $(G - O)/O$.

Numerically:

$(544 - 535)/535 = 1.7$ percent regulation ....[5]

The governor connection to steam pressure should be made at the boiler steam drum.

The differential pressure governor regulation as compared with total head is very small. The regulation is a designed percentage of the differential pressure, not full discharge pressure, as in the constant pressure governor; hence a lighter, more sensitive spring may be used. A normal designed regulation for the better types of self-contained governors is 8 to 12 percent of the differential pressure and can be as low as a fraction of 1 percent of the total head. Using the relay type—either pneumatic or hydraulic—here again, as in the constant pressure depending on the pump discharge pressure.

Also added to Fig. 3 is a constant speed curve *CD*, representing a synchronous or induction motor driven pump. Actually, an induction motor has a slight speed rise as load decreases, but this rise is so small that it can be considered negligible here. Curve *JK* shows a steam turbine driven pump under control of a constant speed governor of the mechanical flyball type, using no relay force or travel amplifiers. It is shown with a speed regulation of 3 percent speed rise from full capacity to zero capacity on the pump. With a special relay type speed governor, this speed rise can be normally halved. Fig. 3 now shows a fairly complete picture of part load operation of identical pumps with different driver characteristics.

It can be seen at once that the following combinations of identical pumps driven by both motors and turbines may not parallel satisfactorily:

1) A motor driven pump which has a pressure rise appreciably different from the turbine constant pressure governor regulations during operation on the curve at low capacities. Curves *CD-EF*.

2) A motor driven pump and a turbine driven pump under control of a differential pressure governor — Curves *CD* and *GH* — without a special valve employed to equalize pressures.

3) A motor driven pump and a turbine driven pump under constant speed governor control when operated on the curve at very low capacities. Curves *CD* and *JK*.

4) A motor driven pump with a turbine driven pump under control of a constant or differential pressure governor where the pump suction pressure varies appreciably. The turbine will change speed to make up any variation; the motor will not.

5) A motor driven pump with a turbine driven pump under control of a differential pressure governor where boiler steam pressure varies appreciably. The turbine will change speed to make up any variation; the motor will not.

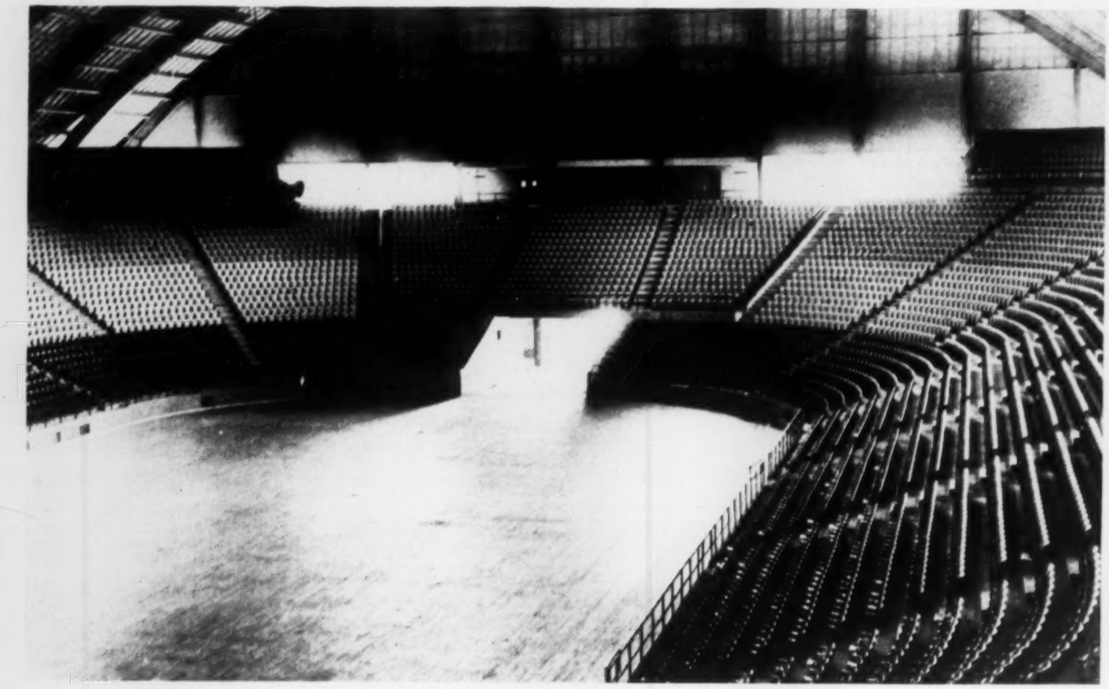
Hence, it is important in specifying new pumps to be added to existing units, to make sure that there is a reasonable duplication of operating characteristics between motor and turbine driven units, as well as each motor driven unit.

B Oil Scoop Tube Regulates Hydraulic Coupling

The hydraulic coupling first became adapted to high speed — 3500 rpm — boilerfeed pump drive about 10 years ago. Since that time, many such installations have been installed handling up to 4000 hp. Its chief use is in the larger central station steam plants, where the initial investment for the coupling is justified by the considerable *bhp* savings possible.

Essentially, it consists of two impellers rotating in an oil filled casing. There is no mechanical connection between the impellers, and power is transmitted between impellers entirely by a vortex of oil. Speed is regulated by a scoop tube which changes the amount of oil in the casing.

The coupling is used with a synchronous or induction motor. Speed variation can be controlled automatically to follow the system head curve *AB* in Fig. 1 or 2. (See the previous article in the February HPAC.) One method is to control pump speed directly off feedwater level, in which case the feedwater regulator is inactive. Thus, it eliminates all throttling losses present in many other drives. Of course, it has its own inherent losses due to internal friction and slippage between the two impellers, the slippage losses being proportional to the percent speed reduction. Each installation should be weighed on its own merits as to whether a hydraulic coupling can be justified. ‡



UNIVERSITY OF MARYLAND student activities building, with fixed seating for 12,000, is reportedly the first of its kind with a radiant heating system specifically designed to satisfy the special needs of spectators. Hot water circulating through pipe embedded in 30 in. wide concrete terraces delivers heat at floor level for 26 rows

Two New Activities Buildings

THE PROBLEM of heating two new large public buildings has been solved in different ways. In the 336 by 241 by 102 ft student activities building at the University of Maryland, radiant hot water heating capable of supplying 3,584,000 Btu per hr prevents cold floors and excessive heat. The 130 by 260 by 100 ft Alabama State Coliseum at Montgomery uses gas fired warm air space heaters with a duct system, with a total heat capacity of 9 million Btu per hr.

The new structure at the University of Maryland is of rigid steel frame construction. The outside is face brick, while the roofing is aluminum.

Heated water circulated through wrought iron piping embedded in 30 in. wide concrete treads supporting 26 rows of terraced seating delivers heat where it is most needed — at floor level beneath each seat.

Piping under the straight runs of seats is in the form of simple grids, with semigrids installed in the curved sections at either end of the auditorium, according to the A. M. Byers Co.

The semigrids are engineered to effect balanced water flow through the grids. If placed flat, each semigrid would resemble a quarter circle, with pipes on the inside being shorter than those on the outside. Semigrid piping is used to prevent water from short circuiting through the short pipes. Cross pipes are equalized in length by making several rows near the short side and decreasing the number of passes as the piping progresses toward the long side.

Headers for the grids in the aisles are of 2 and 3 in. diam, while supply and return mains are 4 in.

Expansion joints are located in the mains at critical building joints.

The heating system is divided into two zones, each with its own converter, circulator, and control. Each exchanger provides 1,792,000 Btu per hr, using 1680 lb of steam per hr to heat water for the system. Steam is supplied by the university's heating plant, which uses pulverized coal. Each circulator provides 162 gpm against 15 ft hydraulic head.

Wall diffusers at floor level below the seats of the main arena provide ventilation. Exhaust air is expelled by eight propeller fans on the roof.

Heating contractors were the William H. Singleton Co., Inc., and the Noland Co.

ALABAMA STATE COLISEUM has permanent seating for 8484 people and can accommodate a total of 15,000 by adding chairs. The Coliseum is the first of a series of structures which will become a state agricultural center. A warm air duct system provides tempered, filtered air at stand entrances. Heaters are under the stands

Solve Heating Problems Differently

In the University of Maryland's student activities building, radiant hot water floor panels prevent cold floors and excessive heat. In Alabama's State Coliseum, a warm air duct system supplied by seven concealed space heaters provides tempered, mixed, and filtered air.

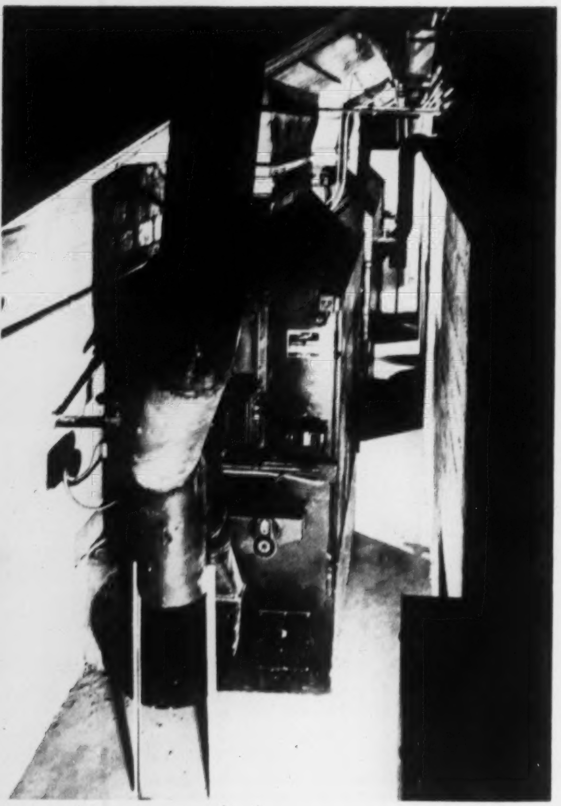
The barrel-arch roof of the Alabama Coliseum, which curves up to a height of 100 ft above the arena floor, posed a real challenge for heating engineers, according to the Dravo Corp. This space is so large that spectators in one section could be uncomfortably cold while others elsewhere would be too warm.

To obtain uniform heating, seven 1,500,000 Btu per hr, automatic, gas fired, modulating, warm air space heaters were installed. Ducts carry warm air from the large heaters to all levels.

Six units are mounted in two groups of three under the stands on opposite sides of the arena. Each group gets its air from a plenum chamber where makeup and return air are mixed. Outdoor air is filtered, and automatic controls mix outdoor and return air in proportion to the building needs.

The heaters' gas burners incorporate electronic flame control, automatic electric pilot ignition, timer, necessary switches, line starters, relays and fuse blocks, all mounted in a single control cabinet fastened to the heater. Also a part of the heater control system are a fan and limit switch, ignition transformer, solenoid pilot gas valve, diaphragm type main gas valve and modulating valve with motor, gas pressure regulator, hand shutoff valve, and stack switch.

Outdoor air is supplied through special entrance tunnels. Recirculated air returns from the arena area through exit pasageways and down stairwells. Each heater has its own blowthrough fan and duct to bypass part of the mixed tempered air. The remainder goes through the heater and again mixes with the tempered air as they flow into the distribution duct. The air then is distributed into



WARM AIR DIFFUSERS at all entrances to Alabama Coliseum seats distribute air uniformly at all levels throughout the large seats distribute air uniformity at all levels throughout the arena, which is the largest enclosed arena in the world

WARM AIR SPACE HEATERS, each with a capacity of 1,500,000 Btu per hr, are installed in groups of three on opposite sides of the Alabama Coliseum

the arena through outlets at stand exists.

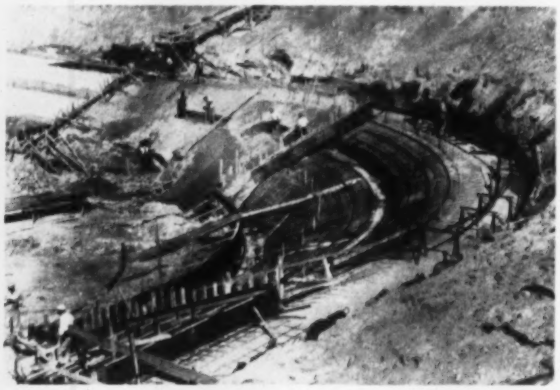
The system is supervised by technicians constantly checking temperature, humidity, and ventilation in two crow's nests.

Body heat from spectators is sometimes so great that heaters must be turned off and 14 exhaust fans — 5500 cfm units — operated to maintain comfortable conditions. Since the heaters contain no refractory to obstruct heat flow or store it for emission after the heaters trip off, heater operation can be easily controlled to meet requirements. Exhaust fans are operated to ventilate the building before ceiling air reaches the dew point because of body moisture.

When the exhaust fans start up, heater blowers come on automatically through static pressure control to prevent negative pressure being built up. The heaters can operate independently of the exhausters for 100 percent recirculation when needed for initial warming of the structure.

The heating contractor was Butler & Cobbs. ±

STUDENT ACTIVITIES BUILDING at University of Maryland has two heating zones, each with its own converter, circulator and control. University plant provides steam



SEMIGRID PIPING, resembling quarter circles, prevents water from short circuiting through short pipes of radiant heating system at University of Maryland

The Law and Your Profits

By William Hurd Hillyer

Profits Not Lienable, Says Court

. . . unless included in the contract price or in the reasonable worth of labor or materials furnished. A subcontractor's appeal is sustained in suit for payment in full when he seeks to enforce mechanic's lien against new high school.

NO ONE looks forward to seeking mechanics' liens, but there are occasions when they must be used. The following case is instructive as to what items may be included in a lien and as to the respective statuses of a sub and sub-subcontractor. All names herein are fictitious.

In the erection of a new high school building, Warm & Kule, Inc., furnished heating and piping systems. Labor and material for installing sheet metal ducts were supplied by Ferro-Laminar Co. This concern acted as subcontractor on part of the job and as sub-subcontractor on the remainder. Since the same principle of the law governs in each instance, the court treated the cases as one.

When payment in full was not forthcoming within a reasonable time, Ferro sought to enforce the debt by means of a mechanic's lien against the property. Attached to his bill in equity was a so-called "exhibit" embodying a detailed statement of labor and materials furnished. These items totaling $4470.02 were followed by:

12 ½ percent Tax and Insurance	$193.19
15 percent Overhead	670.50
10 percent Profit	447.00

These above quoted addenda boosted the total to $5780.71.

In the suit where Ferro acted as sub-subcontractor, the contract price was set up as $13,350 less credits, reducing the sum to $6700. A breakdown sheet, similar to that submitted in the first case, listed and priced labor and materials item by item, and then added:

Insurance, 10 percent of labor	$501.98
Overhead, 15 percent	1916.42
Profit, 10 percent	1277.61

Reduced to simple arithmetic, these figures mean that Ferro was seeking a lien for some $5000 over and above subcontract and sub-subcontract, a sizeable amount.

It was never disputed that the itemized lists of labor and materials represented Ferro's actual cost. The lower court, however, disallowed the listed items for taxes, insurance, overhead and profit, together with a claim of "Transportation, $78.00." Accordingly, plaintiff Ferro appealed.

Conceding an element of uniqueness in this case, the state supreme court had no hesitation in saying at the outset that "such items as profit, overhead, taxes, insurance, and even transportation, *as such and standing by themselves*, are nonlienable." Nevertheless, the court saw a way, founded upon precedent, "in which this issue must be resolved. The lien is dependent upon the existence of a contract" and is security for a legal liability to pay. "There may be an *express* contract creating the obligation of the owner, as is usual between him and his prime contractor. Or," the justices said, "there may be an *implied* contract, as when labor and materials are furnished with the knowledge and consent of the owner, and under such circumstances as would raise a legal and moral duty to pay. . .

"Profits and commission ordinarily are not lienable items unless included in the contract price or in the reasonable worth of labor or materials furnished." On the other hand, the learned justices declared, the subcontractor is not limited to his actual costs. "Business is operated for a profit. When a businessman's costs are not excessive, the fair value of what he sells, delivered and in place, will ordinarily exceed his own costs. Otherwise, business concerns could not exist. Fair and reasonable value must be tested in the light of probable cost to the owner in a free and open market."

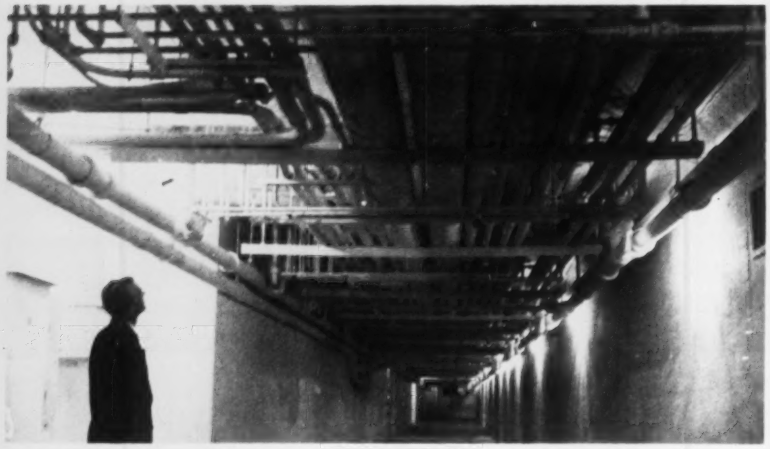
The justices saw an additional factor. According to evidence, the prime contractor — Warm and Kule — submitted to the owner a list of his subcontractors and their bids, among which were Ferro's. The corporate owner, "tacitly at least, accepted and approved plaintiff's bid as representing fair value of labor and materials to be incorporated into its property . . . We think that if the contract be fully and properly performed, the owner is estopped" from asserting that the fair value is less than the sum approved and agreed upon.

For these reasons — and holding that such items as taxes, insurance, overhead, and profits cannot be disregarded — the higher tribunal sustained Ferro's appeal and remanded the case for further hearings. ✝

[Note: While this discussion applies to an actual case, it should be remembered that legal rules vary in different states.]

WILLIAM HURD HILLYER, author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. A former vice president of the Atlanta Trust Co., his work there gave him a practical legal background.

Truck-Wide Utility Tunnels



Cut Piping Maintenance

At Union Oil Research Center

1855 linear ft of underground corridors, 9 ft high and 11 ft wide, stretch under three main lab buildings. Two access ramps enable pickup and flat bed trucks, with repairmen aboard, to enter for quick piping repair. No scaffolding or ladders are needed.

UNION OIL CO.'s $10 million 232,000 sq ft Brea, Calif., research center is a "maintenance man's dream." One of the U.S.'s most modern petroleum laboratories, the one-story center was designed specifically to eliminate costly uptrenchings and the tearing out of building walls when maintenance, and/or additional piping is required.

Unusual are the 1855 linear ft of underground, reinforced concrete utility corridors which run beneath the three main petroleum chemistry lab buildings, and through which a maze of piping is carried to work benches. Unlike many utility tunnels, which are often small, unhandy places in which to work, the research center's utility corridors are truck-size.

Corridors measure 9 ft high, 11 ft wide, and are designed with two access ramps so that pickup and flat bed trucks, with repairmen aboard, may enter the corridors for quick repair. No scaffolding or ladders are required to reach piping, which is hung exposed, from ceiling brackets. All piping is color coded at intervals and nameplate stamped.

Every 10 ft along the tunnel roof is a slot, leading to labs above. Slots were designed, in most cases, to exit between two back-to-back lab benches, so that piping would be concealed. Piping takes off from main corridor manifolds at each of these 10 ft intervals. Some 3500 individual valves — bench outlets — are installed. All piping was precut and of screwed pipe, laid out to templates. All tees and ells were prefabricated. Risers were precut but installed on the job.

All piping is readily accessible. The sides, backs, and ends of benches are removable so that maintenance men can get to the piping, which runs in a 6 in. wide utility service strip behind benches. For pipe runs to benches along the external lab walls, there are slots through the lab floor every 20 ft.

The complex of piping running through the utility corridors brings to labs such facilities as: compressed air, natural gas for burners, vacuum, hot and cold domestic water, distilled water, 125 psi high pressure steam, 10 to 14 psi low pressure steam, and where demanded such elements as oxygen, hydrogen, carbon dioxide, and nitrogen. Compressed air comes to labs at either 60 or 125 psi.

Typical corridor ceiling runs are:

1) 125 psi steam lines, with 1½ in. screwed pipe, cast iron fittings.

2) 1½ in. compressed air lines, like other high pressure systems, of double extra strength seamless steel, all-welded joints. The same type of piping carries carbon dioxide, hydrogen, and other chemical elements to lab benches.

3) Distilled water, carried by ½ and ¾ in. diam 2S aluminum lines.

4) Process piping, of 18-8 stainless steel, with fittings of the same material.

5) Vacuum lines, ½ in.

6) Domestic cold water, 1½ in.

7) Hot water lines, 1½ in. copper.

8) Conventional type wastes from benches — from 1½ in. tellurium lead piping — empty into 4 in. vent pipes and traps of high silicon iron, then to the main waste disposal sewer system, which is of the same material.

9) Risers and valves off mains — in underground corridors — usually ⅜ in. with ⅜ in. valves and fittings.

A typical utility branch through pipe slots from corridor to laboratory shows that all laterals are ½ in. diam except steam laterals, which are ¾ in. diam.

Utility corridors are equipped with strategically located sump pumps. Pumps are automatic electric, with a ½ hp motor, float switch, and motor control. These pump to storm sewers via 1½ in. pipes, through 1½ in. check valves and 1½ in. gate valves.

The center's steam plant is installed with two 150 psig, gas fired steam boilers, for process and building heating. The system is fully automatic. In the same building are six 60 hp compressors, designed with sequence starting so that the rotation of sequence may be controlled to distribute evenly the operating time between various air conditioning units.

The labs and administration building are air conditioned, the units being concealed above suspended ceilings in the buildings' hallways. Air flow is designed to circulate through both offices and labs, but the exit flow is from office to laboratory, pulled out by two suction fans in each building. This, of course, is to keep fumes from laboratory offices, which are directly across the halls from labs. All labs are on the north sides of the buildings, for "studio effect" lighting and to allow controlled air flow to labs.

Chemical fume hoods are installed in each lab, confining gases and exhausting them through a system separate from the plant's air conditioning system.

The research center was designed by the architectural firm of Austin, Field & Fry and was constructed by P. J. Walker Co., Builders. The piping subcontractor was the S. Glen Hickman Co.

How Corridors Cut Maintenance

Reduced maintenance costs have proved the original outlay "worth it. . .and more," according to Union's general services manager, B. T. Anderson. It is he who heads up routine maintenance, who supervises the daily "walk through" — or, on occasion, "truck through" — of all underground tunnels.

What are the maintenance bonuses from subterranean utility corridors of this type? Here are a few:

1) Convenient, continual, and complete tearout and repiping, simply by hookup of a few tees and short — 6 to 7 ft — runs off main tunnel headers.

2) In-tunnel low points of many pipe systems allow air lines, for example, to be rigged at each end of the tunnel with knockout pots, which permit the lines to be periodically blown out and cleared. Scrubbers installed at the in-tunnel low end of gas lines remove condensate and scale from that system. Installation is inexpensive, requires no deep sumps.

3) Maintenance men work overhead and right handed. There's no stoop, no cramp.

4) Most leaks can be repaired within a few minutes, because all are within step ladder reach.

5) No interference hampers scientists at work when piping systems are serviced.

6) Tightening and caulking joints on noncorrosive air and vacuum lines that work loose is so routine that it's assigned to a single maintenance man on his regular "walk through" beat.

7) White painted piping and white tunnel walls help detect leaks.

8) Soon after construction, a design flaw became apparent: air line tees had been installed downward. Condensate was reaching the labs. In most piping systems, this would mean costly repair, calling for extensive excavation. At Brea, re-positioning some 200 tees, turning them up, was a routine wrench job and nothing more.

9) The corridors are, in effect, specialized basements. Installed in the main tunnel's 3 ft pipe area are such devices as gas scrubbers, vacuum machines, and regulators for air and voltage. These are hung from brackets, just as the piping. The 6 ft clearance is maintained throughout.

10) Recently, when lead sink pipe was badly corroded by mercury dumped into sinks, Union ordered installation of mercury traps in many labs. In most cases this involved new runs of lead piping. It was considered a routine assignment. Required were only short runs from bench back to the main industrial waste header in the tunnel below. New piping was routed through existing utility slots. New tees were installed, as were the sumps. In normal underground piping, this would have been a major and costly modification, calling for excavation. As it was, mercury sumps now salvage great amounts of the valuable metal. Salvage has already repaid the repiping cost.

Question of the Month

How Can We Collect Oil Mist?

Three ways to collect oil mist caused by contact of cutting oil against high speed grinding spindles are: 1) an oil extractor utilizing staggered rows of semicircular baffles; 2) kitchen type hood with filter from which oil drains down to machine via copper tubing; 3) hood with a wire mesh entrainment separator. An equation is given for deriving the required velocity of the vapor through the wire mesh entrainment separator.

THE QUESTION, *"How Can We Collect Oil Mist?,"* was asked previously in HPAC and is repeated here along with answers that have been received. Other answers for publication will also be welcome.

"We are trying to determine the most suitable method for collecting the mist emanating from the contact of cutting oil against high speed grinding spindles in our plant. Because of several reasons, we are not in a position to use the electronic type of precipitator."—C.N.

G. W. T. KEARSLEY—

"Hoods Over Spindles Exhaust Oil Mist"

THE COLLECTION and removal of the oil mist can best be effected by the use of a small typical air exhaust system with hoods over the spindles, the design of which would depend upon the physical arrangement of the machines and space limitations. The mist should be captured by the hoods as near the source as possible. The air volume and the velocity in the hoods should be only enough to remove the objectionable mist and vapors without picking up the larger drops which would normally find their way into the oil catch pan.

For the removal of the entrained oil from the air stream, a wire mesh type of entrainment separator is suggested. Fine wire is knitted into a tubular mesh which is flattened and rolled into a pancake about 6 in. thick and the required diameter for placing in the air steam somewhat like a filter in use. The fine liquid droplets are impinged on the extensive wire mesh surfaces where they coalesce, and the liquid drains free while the clear air passes on through.

These wire mesh de-misters have been operated satisfactorily when positioned for either horizontal or for vertical air flow. Their effectiveness appears to be a function of both the number of targets per unit of depth and the velocity of the gas through the medium.

C. Leroy Carpenter of the Polytechnic Institute of Brooklyn in his paper, "Entrainment Studies," gives the following equation for deriving the required velocity of the vapor through the wire mesh entrainment separator:

$$V_s = V \sqrt{26.8\ V_1 / 0.01672\ V_v}$$

where V_s = standardized velocity, ft per sec; V = vapor velocity, taken as air flow divided by gross demister face area; V_1 = specific volume of the liquid at operating conditions; V_v = specific volume of the vapor at operating conditions.

Optimum separating efficiency is said to occur when the vapor — air — velocity is derived from the formula using standardized velocities of from 4 to 12 fps. In the design of steady flow installations it is recommended that the median, 8 fps, be substituted for V_s in the above equation.—G.W.T. KEARSLEY, Engineer, Oak Ridge, Tennessee.

WARREN VIESSMAN—

"Use Staggered Rows Of Semicircular Baffles"

THERE ARE many methods of extracting particulate matter, solids, liquids, and vapors from the air or gas stream. Recovery of valuable chemicals, oils, and minerals makes it essential in today's economy that adequate recovery methods be utilized. Also, the effects of atmospheric or gaseous pollution is generally detrimental to the health of persons, animals, and vegetation subject to the same and is often destructive to property and depreciates appearance of structures.

Viscous impingement, dry type, and electronic filters are effective but all do not provide the same degree of efficiency and economy, or recovery possibilities of various materials.

A very effective means of completely removing and recovering crude oil mist from natural gas is an ingenious system of pairs of semicircular baffles with one captivating channel on the outer edge of each baffle. Rows of the baffle pairs are staggered. The action is such that the gas steam entering is diverted and caused to take a circular or circuitous path, throwing out the liquid or particulate matter centrifugally and entrapping the same in the captivating channels, where the liquid or solids drain off to a sump and can be recovered or removed. The gas or air continues over the staggered rows of baffles, each row adding to the extraction efficiency. In refinery installations, nine rows are utilized, and the gas leaves clean and dry, all oil mist having been removed, as indicated by a white blotter test on dyed oil.

An oil extractor designed for the capacity and the conditions pertaining to collection and removal of mist emanating from the contact of cutting oil against high speed grinding spindles, should prove an effective and economical solution.—WARREN VIESSMAN, Chief, Mechanical Branch, RDSIM, Headquarters, Air Research & Development Command.

KENNETH M. BAKER—

"Kitchen Type Hood Used Over Grinding Machines"

THE PROBLEM of collecting oil mist was solved recently in our plant with the use of generously sized kitchen type hoods over the grinding machines, a grease eliminator with filters. The cutting oil drains readily from the filters and can be carried down to the machine by the use of $^3/_8$ in. copper tubing.—KENNETH M. BAKER, Dust Control, Inc. ✢

READER ASKS—

"How Should Steam Valves Be Sized?"

"A commonly used rule of thumb for sizing low pressure — under 15 psig — modulating steam valves, is to use a pressure drop through the valve of from 40 to 60 percent of the line pressure just ahead of the valve.

"For higher pressures than 15 psig, the rule says the drop should be 25 to 35 percent of line pressure. This second rule has been questioned, with the statement that modulating valves on higher pressures, say from 20 to 100 psig, should be sized for a greater pressure drop than valves on low pressure lines.

"The rule further says that positive acting — two-position — steam valves should be sized for pressure drops 25 to 50 percent lower than those given above.

"Another rule of thumb for modulating water valves, including three-way mixing valves, says that these valves should be sized for a drop of from 5 to 15 percent of the line pressure ahead of valve. This, when the valve is on the inlet side of a heating or cooling coil. When the valve is on the outlet side of a coil, the pressure drop may be increased by 25 to 50 percent.

"There is much variation of opinion on this subject, and I would like to hear what other engineers have to say about this. I believe that HPAC can clarify the situation by publishing these comments."—F.A.R.

- *YOU ARE INVITED to contribute a question for publication, or an answer to a published question. Please address your reply to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

New Motel Reports On Forced Hot Water Heat

. . . fuel costs 28 percent lower than estimated

A ZONED, FORCED HOT WATER convector heating system is installed at the Chanticleer Court, one mile east of Hagerstown, Md., according to the National-U.S. Radiator Corp.

The compact heating system, with small piping, permits use of the full basement, later possibly to be converted into apartments. A small steel boiler is placed in a small basement room near the center of the 14 unit court.

CHANTICLEER
COURT

The court is divided into three heating zones, each thermostatically controlled. One thermostat controls a zone of seven sleeping units, or half the motel, and another thermostat controls the zone including the other seven units. The motel's owner occupies the four-room quarters having a common wall with part of the motel. This area includes the motel office, a basement recreation room and a basement garage. The third thermostat controls this zone.

In addition to heating the motel, the boiler supplies domestic hot water for a laundry room on the ground level above the boiler room, and for the owner's living quarters.

There are 40 convectors installed throughout the court. Every bedroom has one of these nonferrous heating units beneath each window. A similar smaller model is in each bathroom. Other convectors are in the combination laundry, towel, and linen storage room in the owner's living quarters, the garage, and the office.

In the first heating season, the consumption of No. 2 fuel oil for building heating was about 28 percent below the estimate. For hot water needs in summer months for the motel units, the laundry, and the private living quarters, the oil consumed is priced at about $15 monthly. ✢

On the Job —notes from the field

Re-use Insulation Blocks When Piping Is Re-located

. . . for salt evaporation process

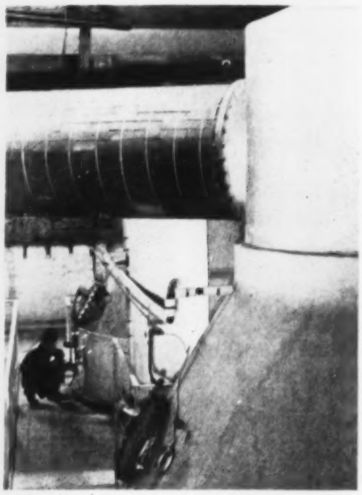
Precise temperatures in a vacuum-evaporation salt manufacturing process at the International Salt Co., Inc., are maintained through the use of cellular glass insulation on evaporator tanks and steam piping, according to the Pittsburgh Corning Corp.

International is renewing, remodeling, and redesigning the entire evaporation system. Since peak production will be maintained and steam and condensation lines shifted constantly, the over-all program will take four years to complete.

The process uses four evaporator units, which handle more than 12,000 gpm of brine and produce 2.6 lb of salt for every 10 lb of brine. Steam is piped in sequence from one evaporator to the other. As the steam temperature decreases, vapor pressure inside the huge tanks is lowered, so the brine will boil. The salt then crystallizes and falls into collectors at the base of the tanks. Since the brine heating differential is only 8 F, insulation is important.

The insulation blocks are being re-used in the reconstruction program. The 2 in. thick blocks were pre-cut in proper size to fit the lines, some of which are 40 in. in diameter.

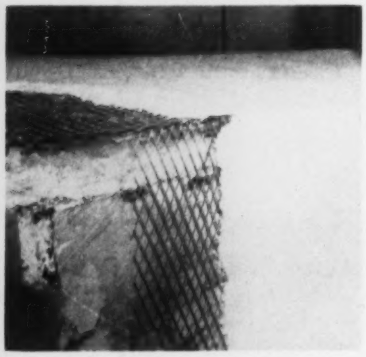
They are removed before the line is shifted and then are replaced. ‡



GLASS INSULATION BLOCKS on 40 in. vapor line were removed and re-applied when line was changed

Damaged Insulation Restored to Efficiency

. . . with finishing cement



INSULATING-FINISHING CEMENT applied in layers up to 1 in. over metal lath hastened repair of boiler breeching insulation

White spun mineral wool insulating-finishing cement simplified repair of accidentally cracked insulation on the main boiler breeching at the U. S. Navy Aviation Supply Depot, Philadelphia, Pa., according to the insulation contractors, Achenbach & Butler, Inc. The quick setting and fast drying cement avoided complete re-insulation and hastened the repair job and provided a finished appearance.

No replacement of the original insulation was required. The breeching was insulated 12 years ago with blankets and two $\frac{1}{4}$ in. layers of conventional finishing cement. Rigid mineral wool block insulation was not applied because of wartime shortages.

Damaged portions of the original cement and blanket material were removed, down to the metal skin of the breeching in a few spots. However, most of the existing blanket insulation was left intact.

Next, heavy gage expanded metal lath was secured to the welding studs which held the blankets. New studs were welded to the breeching where necessary. The lath provided a base for the coat of cement and provided additional support for the old insulation as well. Corner bead was secured to the lath along the duct corners.

The cement, which had to be applied in varying thicknesses to level the surface, then dried to a glaze. ‡

Air Conditioning Helps Restaurant Compete

. . . unit serves five zones

Air conditioning and redecorating has increased his business 40 percent, reports Walter Holman, operator of the attractive and popular Broiler restaurant in Portland, Ore. This increase is in the face of a 15-20 percent decline for other dining establishments in the area.

The Boiler is cooled and heated by a year 'round air conditioner, a single unit which provides separate and individually controlled comfort conditioning for five different areas of the restaurant, with provisions for adding a sixth zone in the future. It is considered one of the most efficient air conditioning installations in the Northwest, according to the Marlo Coil Co.

Commercial Refrigeration Co. installed the air conditioning system, which was designed and engineered by Mark Raymon of Pacific Air Control. ‡

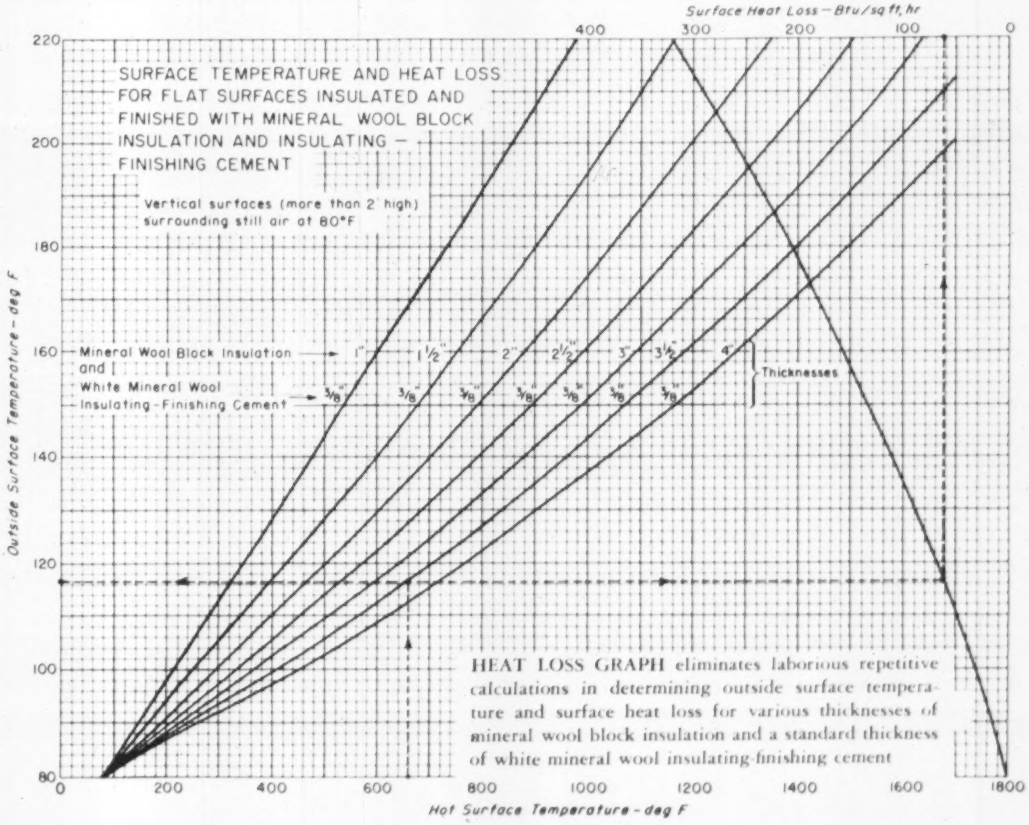
New Specifying Graph Gives Surface Temperature and Heat Losses

. . . for block-and-cement insulation and finish combination

THE COMBINATION of mineral wool block insulation and a white insulating-finishing cement is becoming a frequent specification for the heated flat surfaces of ductwork, hoppers, fan housings and other plant equipment, according to the Baldwin-Hill Co. Accurate heat loss data is helpful in evaluating the insulating performance of the block and cement combination and establishing thickness-temperature specifications.

The accompanying heat loss graph has been developed to eliminate laborious repetitive calculations in determining outside surface temperature, F, and surface heat loss, Btu per sq ft per hr, for various thicknesses of mineral wool block insulation and a standard ⅜ in. thickness of white mineral wool insulating-finishing cement. Standard thicknesses of block insulation from 1 to 4 in. are given. The graph covers hot surface temperatures up to 1700 F — the recommended limit for the block material — and outside surface temperatures as high as 220 F, well above the value that would normally be tolerated.

For each hot surface temperature, the engineer can determine on the graph the combination which will meet requirements or can evaluate the performance of block-and-cement insulation applied.



HEAT LOSS GRAPH eliminates laborious repetitive calculations in determining outside surface temperature and surface heat loss for various thicknesses of mineral wool block insulation and a standard thickness of white mineral wool insulating-finishing cement

Tear out along this line

. . . how graph is derived

In using the graph to determine the insulation thickness required on a 660 F preheated air duct, for example, a vertical line from 660 F on the hot surface temperature scale at the bottom intersects the block thickness line for $3\frac{1}{2}$ in. as shown. A horizontal line from this intersection to the lefthand scale shows that for these conditions the outside surface temperature will be about 116.5 F. A vertical line from the intersection of the horizontal line with the curve at right meets the surface heat loss scale at top right at 62 Btu per sq ft per hr, the heat loss which may be expected from the insulated air duct. The graph also shows that if a surface temperature of 130 F or a heat loss of 100 Btu per sq ft per hr is permitted, the thickness of the block may be reduced to $2\frac{1}{2}$ in.

Following are the formulas, assumptions, and conductivity data which have been applied in calculating surface temperature and heat loss for the given conditions in the graph.

Of course, the same calculation procedure may be accurately applied in all similar heat loss calculations when thermal conductivities of the insulations as functions of mean temperature are known.

While all formulas used are well known, the calculations are not always given in the following step-by-step manner. Even with such a procedure, the interdependence of variables necessitates long, laborious calculations. Graphs, where applicable, then save considerable time in design and specification.

A *Surface Heat Loss* may be determined as a function of outside surface temperature in the righthand curve by adding surface radiation loss — to still air at 80 F — and surface convection loss — from plane vertical surfaces more than 2 ft high — where emissivity is 0.90.

Surface radiation loss:

$$U_r = (1720)10^{-12}\ (0.90)\ (T_s^4 - T_a^4) \quad \text{.........[1]}$$

where U_r = surface radiation loss, Btu per sq ft per hr; T_s = outside surface temperature, absolute, F; and T_a = ambient air temperature, absolute, F.

Surface convection loss:

$$U_c = 1.394\ (1/24)^{0.2}\ (2/T_s + T_a)^{0.18} \times (t_s - t_a)^{1.266} \quad \text{.........[2]}$$

where U_c = surface convection loss, Btu per sq ft per hr; t_s = outside surface temperature, F; and t_a = ambient air temperature, F.

B *Overall Heat Transmission* from the hot surface, through the insulation, and away from the outside surface is:

$$U = (t_h - t_a)/\{[(X_1/K_1) + (X_2/K_2)] + [(t_s - t_a)/(U_r + U_c)]\} \quad \text{.........[3]}$$

where U = overall heat transmission or surface heat loss, Btu per sq ft per hr, $U_r + U_c$; t_h = hot surface temperature, F; t_i = intermediate surface temperature between block and cement, F; X_1 = thickness of block insulation, in.; X_2 = thickness of insulating-finishing cement, in., constant at $\frac{3}{8}$ in. in chart; K_1 = thermal conductivity of block insulation at its mean temperature, $(t_h + t_i)/2$, Btu per in. per hr per sq ft per F; and K_2 = thermal conductivity of insulating-finishing cement at its mean temperature, $(t_i + t_s)/2$, per Btu per in. per hr per sq ft per F.

C *Since Overall Heat Transmission and Surface Heat Loss* are equal under equilibrium conditions, t_s can be determined as a function of t_h for given values of X_1 and X_2 by using Equations 1, 2, and 3 and conductivity data — K_1 *and* K_2 — such as that given below. "Cut and try" calculations involve these steps:

1) For specific values of t_h, X_1, and X_2, assume reasonable values for t_s and interface temperature t_i between the block and insulating-finishing cement.

2) Calculate U_r and U_c in Equations 1 and 2 and determine K_1 and K_2 for mean temperatures $(t_h + t_i)/2$ and $(t_i + t_s)/2$, respectively.

3) Substitute in Equation 3 to determine U. The calculated U should equal $U_r + U_c$ determined in Step 2. The magnitude of the difference represents the accuracy of the temperature assumptions in Step 1.

4) Calculate:

$$t_i = t_h - (X_1/K_1)U \quad \text{.........[4]}$$

$$t_s = t_i - (X_2/K_2)U \quad \text{.........[5]}$$

5) If both t_i and t_s calculated in Equations 4 and 5 are sufficiently close to the values assumed in Step 1 — such as within ± 1 F — the value t_s is then acceptable. If either or both are not close enough, use the calculated values in Step 4 as the assumed values in Step 1, and continue to repeat Steps 1 through 4 until the condition of closeness is met.

D *Thermal conductivities* — in Btu per in. per hr per sq ft per F — as functions of mean temperature, F, used in the graph for mineral wool block insulation and insulating-finishing cement are:

Block Insulation, K_1	Cement, K_2
0.33 at 100 F	0.623 at 75 F
0.36 at 200 F	0.640 at 100 F
0.39 at 300 F	0.696 at 200 F
0.42 at 400 F	0.752 at 300 F
0.465 at 500 F	0.809 at 400 F
0.51 at 600 F	0.866 at 500 F
0.565 at 700 F	
0.625 at 800 F	
0.69 at 900 F	
0.755 at 1000 F	
0.825 at 1100 F	
0.90 at 1200 F	

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Dependence of Water Vapor Permeability on Temperature and Humidity

By S. C. Chang*, Saskatoon, Sask., and N. B. Hutcheon**, Ottawa, Ont., Canada

SUMMARY—The present approach to the calculation and prediction of vapor flow through materials uses a simple flow equation with vapor pressure as the potential. The corresponding coefficient of permeability is, for many materials, a function of temperature and humidity. Ways of correlating dry-cup and wet-cup permeance data to provide the necessary permeability coefficients for the isothermal case are presented and discussed. Test data obtained for two building papers over a range of temperatures and humidities are presented. The effect of a temperature gradient, in the general case of vapor flow, is not yet established, and may introduce great complication, requiring an equation which recognizes surface-film and capillary migration under a moisture content gradient combined with vapor diffusion occurring under the vapor pressure gradient.

In many situations a knowledge of the movement of moisture through unsaturated materials is of interest or of importance. These may occur in the design of walls and roofs to avoid condensation, in the design of wetting or drying processes, in the estimation of humidifying and dehumidifying loads, in the selection of packaging to control moisture content, and in the prediction of the moisture content in any material exposed to changing conditions. Many of these cases are of direct concern to the air-conditioning engineer. The need for more and better data is growing rapidly. It is of interest to re-examine the basis on which data are presently obtained and to take stock of the present position.

The movement of moisture through unsaturated material is broadly considered as a vapor flow so long as the water crosses the boundaries of the material or materials in the vapor form. The transmission of water vapor under these conditions is regarded as a vapor diffusion process although under many conditions the water molecules may not all remain in a true vapor state within the material. It is this situation resulting from various interactions between the molecules of water and those of the substance through which it is passing which complicates the study of flow in unsaturated materials and prompts the use of the term moisture rather than vapor. It is with migration of the type normally referred to as water vapor flow with which this paper is concerned.

Vapor Flow Equation

Engineering calculation of vapor flow has to date been based on a simple flow equation, analogous to that used in heat transfer. The basic form is:

$$w = \mu\,(dp/dx) \qquad (1)$$

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**Assistant Director, Division of Building Research, National Research Council of Canada. Member of ASHAE.

For presentation at the Semi-Annual Meeting of the American Society of Heating and Air-Conditioning Engineers, Washington, D.C., June 1956.

where

w = weight of vapor transmitted through a unit area in unit time.
p = vapor pressure.
x = distance along flow path.

and hence:

dp/dx = vapor pressure gradient.

and

μ = coefficient of permeability, or simply, permeability.

This equation is of the same form[1] as the diffusion equation describing Fick's Law which is frequently applied to diffusion processes. The weight of vapor transmitted is proportional to the vapor pressure gradient, provided μ is a true coefficient as implied, and is independent of p and x.

The Permeability Coefficient

It would be convenient if the permeability were constant for any particular material. Unfortunately this is not always the case and it becomes necessary to determine if possible the factors which cause it to change and their relation, quantitatively, to it.

Barrer[2] from experimental evidence states that membranes which sorb little water behave at low relative humidity as indicated by Fick's Law, that the more hygroscopic the substance the lower is the humidity above which this relationship breaks down and that the increase in permeability follows roughly the increase in water sorbed.

Joy et al[3] have presented extensive data on sugar pine wood indicating a marked increase in permeability with relative humidity beginning at about 50 percent. They acknowledge the probability that the sorption of water in these materials, in amounts which increase with relative humidity, may be responsible for the increased vapor flow. Babbitt[4] has presented similar data for plywood and two types of building paper.

Babbitt[1, 4, 5] assumes that sorption contributes to flow by making possible movement of the water molecules as adsorbed layers on internal surfaces, and believes that the departure of the diffusion from Fick's Law is due to this. Following the method used by Muskat he has analyzed three of the currently held adsorption theories and has concluded that the corresponding value of permeability ought to increase with relative humidity at an increasing rate for hygroscopic materials.

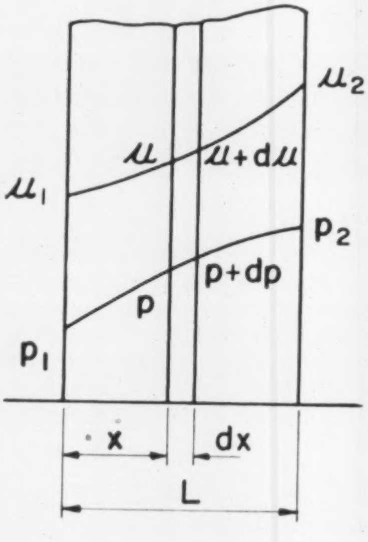

Fig. 1—Variation of vapor pressure and permeability throughout a homogeneous sample

At high relative humidities sorbed films become thick enough to merge in small capillaries, filling them. A liquid-type flow then becomes possible. Johansson[6] considered moisture transfer as a combination of capillary movement and gaseous diffusion. The value of permeability which he determined was a function of many factors, including the diffusion constant of air, the size of capillaries, and the viscosity and density of water vapor. He concluded that in general permeability ought to increase with relative humidity although the reverse could be true if the capillaries were specially sized.

Temperature may also have an effect on permeability, leading to different values of permeability at different temperatures for the same relative humidity. Barrer[2] states that changes in temperature have a marked effect on the permeability constants of the least permeable membranes but that the constants of porous membranes are independent, or slightly dependent upon, temperature. Doty et al[7] found a wide range in the temperature dependence of the permeability of several polymer films of the type used in packaging.

It may be possible to describe the effects of temperature for certain materials on the basis of activation energy. This is a concept developed from kinetic theory to explain the effect of temperature upon rate of chemical reactions. It is based upon the premise that only the molecules having kinetic energies above a certain level can enter into a reaction. Its application to certain types of diffusion processes[2] leads to an equation of the form:

$$\mu = \mu_o e^{-E/RT} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

μ_o = permeability for $T = \infty$.
R = gas constant.
E = activation energy.
T = absolute temperature.

Application of this equation to vapor transmission may be limited to materials such as rubbers, resins, and polymers in which the water molecules enter and move through the molecular structures by a process known as *activated* diffusion. A positive value of E indicating an increase in coefficient of permeability with temperature has been found for a variety of such materials[2, 7]. This equation may also serve, however, as a basis for an approximate temperature correction in other cases.

Equation 2 is readily applied to data in a graphical solution when transformed to:

$$\log \mu = \log \mu_o - (E/RT) \quad \ldots\ldots\ldots (3)$$

A straight line of slope $-E/R$ is obtained in a plot of log μ against $1/T$. The intercept with the Y-axis is log μ_0. Any two values of μ for different temperatures but at the same relative humidity may be used to establish the slope of the line, and, therefore, the value of E, from which the coefficients for other temperatures may be established.

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[1] Exponent numerals refer to References.

The Average Permeability

When moisture is transmitted through a material the temperature and humidity may vary along the path of transmission. As the discussion of the previous section indicated, the permeability, μ, is likely to be, in practice, a function of relative humidity and temperature and to have different values from point to point.

Some simplification may be introduced if the possibility of a temperature gradient is disregarded, and only isothermal cases considered. The permeability μ can then be regarded as a function only of vapor pressure (or relative humidity) at any particular temperature.

The conditions for uni-directional, steady-state flow through a slab of material of thickness, L, can be represented as in Fig. 1, and Equation 1 applied.

Equation 1 may be written:

$$w\,dx = -\mu\,dp \quad\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Integrating Equation 4 from $x = 0$ to $x = L$, and from p_1 to p_2 and dividing both sides by the thickness:

$$w = \frac{-\int_{p_1}^{p_2} \mu\,dp}{L} \quad\cdots\cdots\cdots\cdots (5)$$

or

$$w = \left[\frac{-\int_{p_1}^{p_2} \mu\,dp}{p_2 - p_1}\right]\left[\frac{p_2 - p_1}{L}\right] \quad\cdots\cdots (6)$$

transposing

$$\frac{wL}{p_2 - p_1} = \frac{\int_{p_1}^{p_2} \mu\,dp}{p_1 - p_2} \quad\cdots\cdots\cdots\cdots (7)$$

let

$$\frac{\int_{p_1}^{p_2} \mu\,dp}{p_1 - p_2} = \bar{\mu} \quad\cdots\cdots\cdots\cdots (8)$$

Then Equation 6, rearranged, becomes:

$$w = \bar{\mu}\,(p_2 - p_1)/L \quad\ldots\ldots\ldots\ldots (9)$$

Equation 9 is in the form most commonly used in calculations of vapor flow. The coefficient $\bar{\mu}$ is usually found by the application of this equation to the results of dry-cup, or wet-cup tests carried out on sheets or plates of material at one particular temperature. The results are frequently expressed as a permeance, $\bar{\mu}/L$, which applies to the thickness of material stated or implied, rather than to unit thickness. The values obtained may, however, be unique to the conditions of test since $\bar{\mu}$ is the average coefficient of permeability over the range of vapor pressure in the particular test.

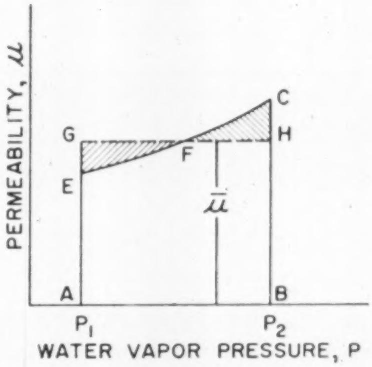

Fig. 2—Variation of permeability with vapor pressure, at constant temperature

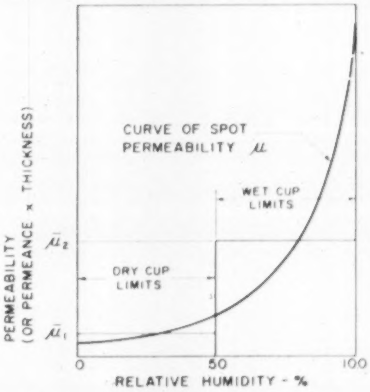

Fig. 3—Relationship between dry- and wet-cup tests and the spot permeability for a material such as wood

The relationship between μ and $\bar{\mu}$ can be more readily seen by reference to Fig. 2 where the permeability μ is plotted against vapor pressure for the conditions represented in Fig. 1.

The coefficient $\bar{\mu}$ is numerically equal to the area ABCE divided by AB, as given by the vertical ordinate to the mean line GH. It may be noted that area GFE in Fig. 2 equals the area FCH and that generally the average permeability $\bar{\mu}$ does not equal the *spot* or *differential* permeability μ at mean vapor pressure $(p_1 + p_2)/2$.

A further representation of the average permeabilities obtained from dry-cup and wet-cup tests carried out at the same temperature but at relative humidities of 0 percent to 50 percent and 50 percent to 100 percent respectively is given in Fig. 3. In this case the plot is against relative humidity, since at constant temperature vapor pressure and relative humidity are for practical purposes proportional. For a curve of permeability varying with relative humidity as shown, the average permeabilities obtained will be $\bar{\mu}_1$, for the dry-cup test and $\bar{\mu}_2$, for the wet-cup test. These frequently differ by a factor of 3 or more for wood and wood products, the wet-cup test providing the higher values.

The Permeability Curve

The permeability μ cannot be measured directly. It is possible, however, from a series of values of average permeabilities for a particular material at a given temperature obtained from suitable tests, to construct a permeability curve such as that shown in Figs. 2 and 3. If in Fig. 3 the average permeabilities for the dry-cup and wet-cup tests were plotted as shown it would be possible to construct a rough permeability curve on a trial and error basis.

The trial curve must satisfy the condition in the case of each of the tests that the area under the curve so constructed between the limits of relative humidity for the test should equal the area under the average permeability line as found from the tests, between the same limits. Consideration shows that four dry-cup tests run at humidities outside the cup increasing in increments of 20 percent would permit a reasonably accurate curve to be drawn, up to the high humidity range.

Once the permeability curve is obtained it is possible to determine by a reverse procedure the average permeability μ for any desired limits of humidity (or vapor pressure) for isothermal conditions at the temperature for which the test data were obtained.

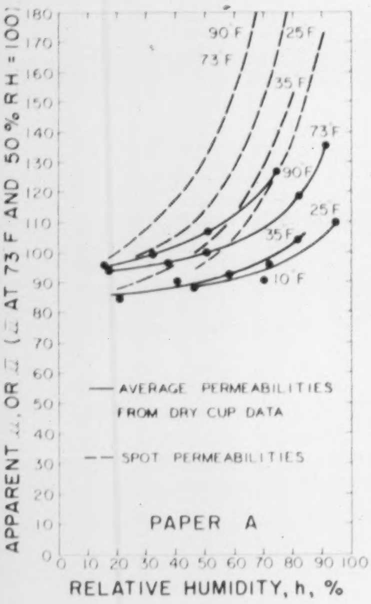

Fig. 4—Permeabilities obtained from dry-cup tests of a 15 lb asphalt-saturated sheathing felt, 0.037-in. thick

A more straightforward method suggested by a colleague involves plotting the values of the integral $\int_{p_1}^{p_2} \mu dp$ calculated from the dry-cup test data rather than

$$\frac{\int_{p_1}^{p_2} \mu\, dp}{p_1 - p_2}$$

which is $\bar{\mu}$.

Babbitt[4] used the device of plotting permeabilities, or permeances where appropriate, against the mean relative humidity for the test conditions, and of drawing a curve through the points obtained from a series of tests. This curve can provide data for other mean relative humidities, and is in effect, an approximate permeability curve. The nature of the approximation is evident from Fig. 3, *i.e:* the true average permeability is not the permeability at the mean humidity. This method may, however, be sufficiently accurate for many purposes.

Further curves of permeability applying to other temperatures can be constructed from test data, for such other temperatures. Some reduction in the amount of testing required to cover a range of temperatures may be obtained by using Equation 2 to extend the data obtained for any two temperatures to other temperatures.

Paper Test Data

The variation of permeance with temperature and humidity was determined for three building papers by an extended series of dry-cup tests. The results obtained for two of these, an asphalt saturated felt, A, and a smooth, lightly saturated and waxed kraft building paper, B, are given in Figs. 4 and 5, respectively. They are expressed as relative permeabilities, as percentages of the test permeability found at the standard *Testing Association of Pulp and Paper Industry* test conditions of 73 F and 50 percent relative humidity. The solid curves are the average permeabilities found from the tests, plotted against the relative humidity outside the cup (0 percent on the inside). These data were reduced to apparent permeabilities, by the method outlined in this paper, which are represented by the dotted curves.

The very marked influence of temperature and humidity on permeability for paper A of Fig. 4 may be noted. Of interest is the reduction in slope of the permeability curve at the higher relative humidities as the temperature is reduced. The error introduced by applying data from the standard dry-cup test conditions to higher humidities without correction and the increasing effects of temperature at higher humidities are apparent. The third paper, an asphalt-saturated building paper showed similar results. Paper B of Fig. 5 gave markedly different results, showing only small increases in permeability with increase in temperature and relative humidity. Hygroscopic moisture data have not yet been obtained for these papers, but similar results might be expected since both are essentially wood products. These results are interesting in view of the relationship which has been proposed between hygroscopicity and increase in permeability with relative humidity, and suggest that another factor must be taken into account. Paper B has a relatively low expansion with increase in moisture content.

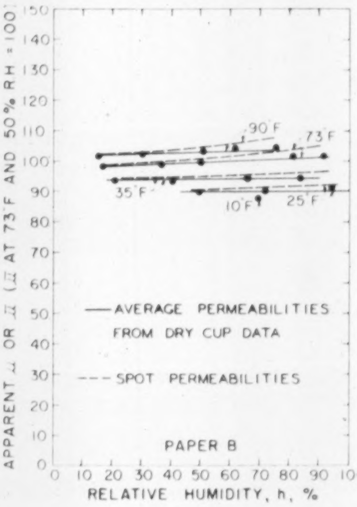

Fig. 5—Permeabilities obtained from dry-cup tests of a lightly saturated and waxed kraft building paper, 0.008-in. thick

Permeability of a Combination of Homogeneous Materials

The average permeability of a combination of homogeneous materials can be determined if the appropriate permeability data are available for each material. This is a procedure of much interest in practice, particularly in calculations of vapor transmission through walls and roofs. The resistance method of calculating an overall coefficient which is employed in the case of heat transmission, by adding the resistances of the various elements, can be used. It must be noted, however, that the individual resistances and, therefore, the overall coefficient, in the case of vapor flow, may vary with humidity in the isothermal case, with both temperature and humidity, and perhaps even with moisture content gradient, when there is a temperature gradient. The humidity limits for each element must be assumed before a permeance value can be selected for it, thus leading to a trial and error procedure.

Another method based on permeability curves can be used for the isothermal case. Fig. 6 illustrates a combination of two materials A and B of thickness L_1 and L_2, respectively. Material A is assumed to be highly permeable and B less permeable, with their corresponding μ-h curves shown in Fig. 7. The ambient humidities are h_1 and h_2 and the interfacial humidity is h_m. The problem is essentially one of finding the interfacial humidity h_m for which the rate of flow will be the same through each of the two materials. It follows from Equations 8 and 9 that the area under the permeability curve between appropriate limits of relative humidity gives the flow rate through unit area for unit thickness of material. The flow rate for thickness, L, is therefore given by the area divided by L. The interfacial humidity, h_m, must therefore be selected so that area 1 of Fig. 7 is to area 2 as L_2 is to L_1. Curves of permeance, or μ/L, might be used, in which case the corresponding areas 1 and 2 would be equal, for equal flow rates. Once the appropriate interfacial humidity is known, the average permeability and the average permeance of the combination can be calculated.

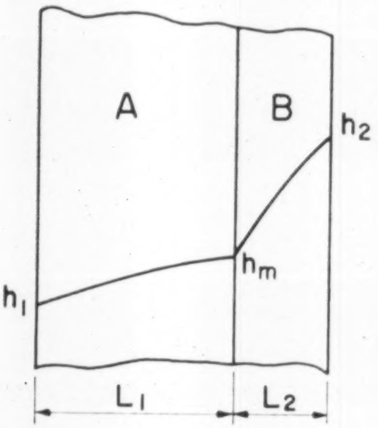

Fig. 6—Simple case of a combination of materials

A reversal of the humidity conditions with A exposed to humidity h_2, and B exposed to humidity h_1, will normally change the value of h_m and the overall average permeability as shown in Fig. 8. The change in $\overline{\mu}$ resulting will depend on the relative thickness of the two materials and on the shape of their respective μ-h curves. This effect is common in the dry-cup testing of coated papers where different results are obtained with different orientation of the test specimen.

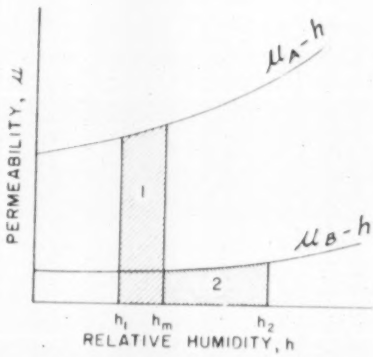

Fig. 7—Permeabilities and relative humidities for a simple combination of materials

The method outlined may be extended to combinations of more than two materials. It does not, however, avoid the need for trial and error in determining the interfacial humidity. As in the case of the construction of the permeability curve, this operation can be facilitated by employing plots of the integrals of the permeability curves so that the new curves give the areas under the original permeability curves at successively higher humidities directly. The need for repeated measurement of areas for comparison is thus avoided since these can be determined for particular relative humidity limits from differences in vertical ordinates to the integral curve.

Effect of Thickness

The method presented for determination and use of permeability curves is predicated upon an assumption not yet stated explicitly, that the permeability coefficient is independent of vapor pressure gradient. Stated in other words the permeability is assumed to be independent of the thickness. Babbitt[1,5] has presented experimental evidence in support of this as have Joy et al[1].

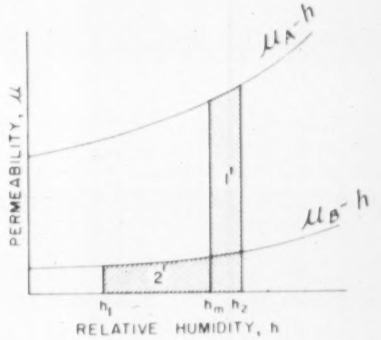

Fig. 8—Permeabilities and relative humidities for a simple combination of materals as in Fig. 7, but for the materials in reverse order

There is some evidence[2] indicating that in certain cases thickness may be a factor. If so, this introduces still another complication in the case of homogeneous materials which may be tested and used in a range of thicknesses, since a simple correction for thickness cannot then be made. It may well be that such effects are to be found at high humidities, particularly for thin films or membranes.

Materials which are non-homogeneous as to moisture properties ought always to be dealt with on the basis of permeance, rather than on a unit thickness basis, and should be tested in the thicknesses used. Results may, however, be expressed as average permeabilities so long as it is recognized that these apply to certain specific thicknesses or arrangements.

Effect of a Temperature Gradient

Experimental determination of vapor flow through a material under the combined effects of both vapor pressure and temperature gradients is exacting and time-consuming. Few such tests have been conducted, and are not particularly revealing as to the influence of a temperature gradient. In the combined gradient case, the relative humidity is no longer proportional to vapor pressure. It is possible, depending on the temperature gradient, to have the relative humidity increasing, decreasing, or increasing and then decreasing along the flow path through the material.

If permeability is a function only of relative humidity and temperature, the methods presented for the isothermal case can be elaborated to deal with the non-isothermal cases. Babbitt, however, attributes the increase in permeability with humidity to the increased sorption and to the migration in sorbed layers under a gradient in sorbed moisture. In the isothermal cases the vapor pressure, relative humidity and sorbed moisture concentration all decrease in the direction of flow. However, with certain temperature gradient conditions, the relative humidity and, therefore, the sorbed moisture concentration can be made to increase in the direction of decreasing vapor pressure[8]. It is thus possible that a vapor diffusion may take place in the direction of decreasing vapor pressure, and be opposed by a film, or by a combined film and capillary migration occurring in the opposite direction.

Edenholm[9] has proposed that moisture migration be expressed in terms of two mechanisms, one a *diffusion* depending only on vapor pressure, and the other a capillary movement depending on a moisture content gradient. He uses separate coefficients for each mechanism, but combines them in one equation. He has further proposed a method by which the coefficients may be obtained and combined for use in a graphical plot. While his method contains many approximations, it is interesting for it attempts to deal with combined vapor pressure and temperature gradients.

Further experimental investigation of such cases is greatly needed.

Calculation of Flow under Combined Gradients

Calculation of vapor flow under combined temperature and humidity gradients can presently be carried out, using the resistance method, based on the simple flow equation. This is a rational method, so long as the permeabilities are reasonably independent of both temperature and humidity. Briefly, this means that it will best apply to the low-to-moderate range of relative humidities for porous, non-hygroscopic materials.

There are at present very limited data from which a selection of permeabilities for design may be made. These are mainly from dry-cup and wet-cup tests and therefore are strictly applicable only to isothermal flow cases. Judgment must be used in selecting design values. It may well be that the simple flow equation based only on vapor pressure as the potential causing flow may have to be replaced by one based on a more involved concept of the mechanism or mechanisms of migration. Until then, it would seem to be best to rely on the simple flow equation, and to use permeability data related as well as possible to the relative humidities in use. The complications of film or capillary migration which may oppose the main vapor flow must be left for further investigation.

Conclusion

Complications in the determination of permeabilities or permeances which have been discussed arise from the use of a simple flow equation. Much of the complexity of the actual functional relationship between flow rate, material properties, and specimen environment, is thus thrown into the permeability coefficient. Whether it is possible to develop a new flow equation with constant coefficients to describe the material properties remains to be seen. The simple flow equation can in the meantime be used, although with difficulty, if the permeability coefficients can be evaluated. It will be a forward step if the nature of these coefficients can be generally recognized, as an aid in stimulating investigation, and promoting rational procedures.

The adequacy of a single test of a material at one set of conditions ought not to be taken for granted. Tests ought to be carried out at two different humidity conditions and at two different temperatures to indicate the degree of dependence of permeability upon these factors. Whenever possible a series of tests over a range of conditions should be carried out for each material. This is the only way at present by which the permeability of a material can be properly evaluated.

Dry-cup tests are relatively simple, although time-consuming. Data from them can be used, by the methods outlined, to establish a permeability curve applicable to the isothermal case. Permeability data over a range of temperature and humidity are available for only a few materials. A very great deal of work will be required to cover even the more common materials. Variations in properties from one sample to another are frequently great and lead to an increase in the number of samples to be tested.

Research must be carried out to establish more definitely the nature of the dependence of permeability upon temperature, relative humidity, and thickness. It may then be possible to find ways of reducing the amount of testing required for evaluation of a particular material.

The discussions presented have dealt largely with flow under isothermal conditions. There is great need for some method of dealing with the general case of a temperature gradient together with a vapor pressure gradient. This will provide more complications than the isothermal case, since under a temperature gradient relative humidity and vapor pressure are no longer directly proportional, and their relationship is different for each new set of temperature conditions. The gradient of concentration of sorbed moisture which is largely dependent upon relative humidity may differ in relation to vapor pressure and to the vapor pressure gradient from one case to the next. As a result, the migration of sorbed moisture may for certain conditions oppose the vapor flow, whereas in the isothermal case these are more simply related and are always additive.

Acknowledgments

This paper is a contribution from the program of cold weather wall research being carried out co-operatively between the University of Saskatchewan and the Division of Building Research, National Research Council. The paper test data presented were obtained from a post-graduate research project carried out by the senior author. The authors are indebted to G. O. Handegord, officer-in-charge of the Prairie Regional Station of the Division, for his interest and assistance, and to Dr. T. D. Northwood of the Building Physics Section of the Division, at Ottawa, for the suggestion to use the integrated permeability curve.

References

1. Observations on the Permeability of Hygroscopic Materials to Water Vapor, by J. D. Babbitt (*Canadian Journal of Research*, A, 18, 1940, pp. 105-121).

2. *Diffusion In and Through Solids*, by R. M. Barrer (Cambridge: The University Press, London, 1951).

3. Water Vapor Transfer through Building Materials, by F. A. Joy, E. R. Queer, and R. E. Schreiner (*Bulletin* 61, *Engineering Experiment Station*, Pennsylvania State College).

4. The Physics of Condensation in Buildings, by J. D. Babbitt. (*N. R. C. Bulletin No.* 2, 1952. *National Research Council*, Ottawa).

5. The Diffusion of Water Vapor through Various Building Materials, by J. D. Babbitt. (*Canadian Journal of Research*, A, 17, 1939, pp. 15-32).

6. Theoretical Investigation of the Effect of Capillary Suction on Transmission of Moisture in Hygroscopic Materials, by C. H. Johansson (*Transactions of the Royal Institute of Technology*, M, 20, Stockholm, 1948).

7. Temperature Dependence of Water Vapor Permeability by P. M. Doty, W. H. Aiken and H. Mark. (*Industrial and Engineering Chemistry 38*, No. 8, 1946, pp. 788-791).

8. Moisture Migration in a Closed Guarded Hot Plate by N. B. Hutcheon and J. A. Paxton (ASHVE TRANSACTIONS, Vol. 58, 1952, pp. 301-320).

9. Moisture Movement and Moisture Distribution in the Walls of Buildings. H. Edenholm (*Meddelanden fran Statens Forskningskommittee for Lantmannabyggnader*, No. 5: 53-76, 1945. Also available as Technical Translation TT-361, *National Research Council of Canada*, 1952).

REVISED GERMAN HANDBOOK

For the first time in several years, there is available a revised edition (the 48th) of the well-known German handbook *Taschenbuch fur Heizung und Luftung*. This book which formerly appeared in annual editions is well-known to many engineers who are acquainted with German practices. The current edition, edited by Eberhard Sprenger, contains some 650 pages along with some 500 diagrams and approximately 300 tables.

While the book contains a considerable amount of information, its use by English speaking engineers is difficult, as all data are in metric units.

The present edition of the handbook is divided into six sections. Section 1 covers basic design data; section 2 describes heating systems and their applications; section 3 presents design and installation data on ventilating and air conditioning plants; section 4 deals with hot water supply; section 5 is concerned with industrial exhaust; section 6 contains German standards, regulations, and bibliographical material.

The handbook is published by R. Oldenbourg Munchen, price 32 DM.

John R. Allen Memorial Library

The ASHAE Committee on Research gratefully acknowledges the following gifts to the John R. Allen Memorial Library, which is maintained at the Society's Research Laboratory, 7218 Euclid Ave., Cleveland 3, Ohio.

The Boyle System of Ventilation, by Robert Boyle. Gift of H. C. Murphy.

The Motion of Fluids in Particular Air & Water, by Martin Clare. Gift of H. C. Murphy.

Taschenbuch fur Heizung und Luftung (Handbook of Heating and Ventilating), by Recknagel-Sprenger. Gift of Dipl.-Ing. Eberhard Sprenger.

A Treatise on Ventilators, by Stephen Hales. Gift of H. C. Murphy.

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The presentation of textbooks and pamphlets in the field of heating, ventilating and air conditioning and allied fields, by authors and others, will be welcomed by this library. Suitable book plates carry the name of the donor and date of the gift.

INDIANA CHAPTER ESTABLISHES MILLER AWARD

The Indiana Chapter has established the *William T. Miller Award*, and it is expected that the first of these awards will be made at the May meeting.

The Award consists of a permanent plaque mounted in the Mechanical Engineering Building at Purdue University. Each time an award is made, the recipient's name is added to the plaque.

The chapter set up the award to honor Professor William T. Miller; to recognize outstanding members of the Purdue Student Branch; to strengthen the student branch; and to create interest among students in the field of air conditioning.

Announcement of the award was made by W. F. Currise, and it has also been announced that the special committee to select the recipients for the first year will consist of W. F. Currise, chairman, S. E. Fenstermaker, Jr. and F. B. Morse.

A Symposium on Air Pollution

C. H. Pesterfield, Moderator

Professor of Mechanical Engineering, Michigan State University

Following is an account of the Symposium on Air Pollution held at the 62nd Annual Meeting of ASHAE at Cincinnati, on January 25, 1956.

Seven well-known experts in various phases of the subject prepared papers which were presented before the symposium session. Discussions and questions from those in attendance were directed to the speakers following the presentation of their papers.

What follows here is not an exact record of the remarks of each speaker in full but is a condensation of their prepared papers.

Public Health Aspects

By W. C. Cooper, M.D. and A. C. Stern

W. C. COOPER, M.D.—Chief, Occupational Health Field Headquarters, U. S. Public Health Service, Cincinnati, Ohio. Commissioned Officer with the U.S.P.H.S. 1941 to date. Received M.D. from University of Virginia 1934. Member: American Medical Association, American Society of Tropical Medicine and Hygiene, Industrial Medical Association, American Association for the Advancement of Science, Royal Society of Tropical Medicine and Hygiene.

A. C. STERN—Chief, Community Air Pollution Program, U.S. Public Health Service, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio. Chief, Engineering Unit, Division of Industrial Hygiene, New York State Department of Labor, 1942-54. Chairman, Sectional Committee on Industrial Ventilation (Z9), American Standards Association. Member, Air Pollution and Standards Committees of ASME, APHA, AIHA, ACGIH, ASTM. Licensed Engineer, Ohio and New York.

Determining the effects on health of air pollution and making recommendations to prevent such effects is a logical function of those assigned responsibilities for public health. When one examines the existing evidence as to health effects, however, and considers the extraordinary complexity of the problems that must be solved to establish cause and effect relationships, it is easy to see how difficult it is to make sound recommendations for control, based on health grounds alone.

Air pollution might conceivably affect health in a number of different ways, namely: inhalation of polluted air; ingestion of food or water contaminated by polluted air; direct irritation of eyes, mucosa, or skin; decrease in solar radiation reaching ground level; and, lastly, the psychological impact of living with air pollution and its effects.

The intensity of air pollution may run the gamut from severe episodes causing death, acute exposures sufficient to cause recognizable illness, nuisance exposures which cause annoyance but without provable health effects, and exposures for prolonged periods to low concentrations of contaminants which may cause chronic effects still unrecognized. Preventive measures must take cognizance of all these varied situations.

The most dramatic air pollution incidents have been those which have resulted in death to a number of people and produced immediate alarm. The best documented are generally well known. There was the Meuse valley, Belgium, episode of December, 1930 in which 63 deaths and several hundred illnesses were attributed, admittedly on inconclusive evidence, to sulfur dioxide and possibly certain fluorine compounds. In the Donora, Pa., episode of late October, 1948, 20 deaths and several thousand illnesses were attributed to the combined effects of two or more contaminants. There was the Poza Rica, Mexico, accident of November, 1950, in which 22 deaths and 320 hospitalized illnesses resulted from acute exposures to hydrogen sulfide. Finally, there was the London, England, experience of December, 1952, for which there has been adduced valid statistical evidence of 4,000 deaths and a large but uncomputed increase in morbidity. Here again additive or synergistic effects of two or more pollutants was suspected.

One general characteristic of the major episodes has been that death occurred mainly among those already weakened by age or other illnesses. This is to be expected, as it is natural that people with the least reserve would be most dangerously affected. The major episodes have also shown that the persistence over a period of time of abnormally high levels of contamination has been an important factor in producing disastrous effects.

It is notable, however, that even in these severe episodes, conclusive relations were established only in the Poza Rica episode, an accident which cannot be regarded as having much relevance to the general air pollution problem. The difficulties in pin-pointing cause and effect relationships at lower levels of pollution and with respect to chronic exposures are staggering and help explain why discussions of health effects so frequently deteriorate into exchanges of discouraging generalities. Fortunately unprecedented resources and energies are currently being brought to bear on these problems.

Ingestion: Although adverse effects on live stock from the ingestion of forage contaminated with certain pollutants are well documented, the effects on humans of the ingestion of food and water so contaminated is entirely conjectural.

Eye Irritation and Nuisance Effects: In many locations throughout the country the concentration of irritating pollutants has from time to time increased to the point where direct irritation of the eyes and mucosa has been observed. This has reached problem proportions most notably on the West Coast. Although studies have failed to reveal any permanent damage anyone who has personally experienced true smog can attest to its nuisance qualities. Among other nuisance aspects of air pollution which have public health significance are odors, which may induce nausea, reduce appetite, and cause individuals in affected areas to sharply restrict outdoor living.

Reduction of Ultraviolet Radiation: A decrease in solar ultraviolet radiation reaching ground level can be presumed to have direct effects although controlled studies are lacking to prove them. These health effects are probably in part offset by artificially irradiated milk and by other dietary supplements containing vitamin D. Absorption of solar radiation also has an indirect effect—that of setting the stage for the psychological manifestations of living in a community where diminished sunlight accentuates dirt and grime.

Chronic Effects: The aspect of the air pollution problem that currently looms largest in the field of public health is the possible effect of inhaling over a period of years low concentrations of the many substances which man's activities are adding to the atmosphere.[2] Evidence is lacking to incriminate air pollution, or any specific air pollutant, as a contributory factor in, say, the alarming incidence of lung cancer, but it would be extremely short-sighted not to explore the possibility with thoroughness. A number of investigators are working to determine if there is a relationship of polluted air to this and other pathological conditions. Much of this research is currently being supported by Public Health Service research grants and research contracts. These research investigations are of four general types:

1. Statistical studies of the relation of mortality and morbidity to residence in areas of general or specific air pollution.
2. Epidemiologic studies in regions of acute or chronic air pollution.
3. Toxicologic studies of specific pollutants, including the development of new toxicologic methods sensitive to the very low concentrations in which pollutants exist in air.
4. The development of medical diagnostic criteria to detect early changes which might in turn clarify etiologic relationships.

Correlation with Environmental Data: In order to establish any correlation between what people breathe and the state of their health, it is necessary to have data on what they breathe. At present these data are, for most communities, inadequate. The deficiency of both the quantity and the quality of the results of air sampling and analysis are recognized, and steps are being taken to improve the situation. It is apparent, however, that in the present stage of knowledge, it is not always easy to establish priorities as to what should be collected and measured.

One should point out however, that the commonly used MAC's (maximum allowable concentrations) of the industrial hygienist cannot be applied as air pollution standards. MAC's are established for exposures of reasonably healthy adults for 8 hrs a day for 5 days a week. No factors are available to extend these data to full time exposures for varying periods of a population ranging from infants to the aged, and including the chronically ill. Furthermore in the development of MAC's there have been relatively few opportunities to consider the complex interplay of mixtures of agents, where new substances may develop, and varied possibilities occur for additive and synergistic action.

In closing brief reference is made to the largest scale correlation of air pollution and morbidity that has been attempted to date. This is the health effects study in the Detroit-Windsor area under the general auspices of the Technical Advisory Board on Air Pollution of the International Joint Commission. In this study, public health agencies at municipal, provincial, and federal levels of both Canada and the United States have joined forces to provide the environmental and morbidity data necessary for correlation. Analysis of the results is not yet completed, nor can one say with assurance that conclusive correlations can be made. The trends observable to date, however, offer encouragement for the implementation of other epidemiologic studies to probe more deeply in the mystery surrounding the impact of Twentieth Century air on a human animal whose respiratory protective mechanisms were developed in a far simpler environment many ages ago.

The Growing Air Pollution Problem

By G. P. Larson

G. P. LARSON—Executive Vice President, Oxy-Catalyst, Inc., Wayne, Pa. Six years Director Los Angeles Air Pollution Control District. Past President, Air Pollution Control Association. Graduate U.S. Military Academy, West Point. Retired with rank of Lieutenant Colonel after twelve-year service in Corps of Engineers, regular Army. Author of scientific papers on air pollution and its control.

Most of the investigations on atmospheric contaminants and their effects have centered around particulate matter and its soiling effects. A number of studies on damage to plants and animals from certain specific contaminants such as sulfur dioxide and fluorine have been reported. Because of the extremely small concentrations of the various contaminating substances, very little work has been accomplished on the measurements of the gas phase materials in the atmosphere or of reactions which occur in the mixtures which might be expected in every industrialized area.

The advent of smog in Los Angeles in 1942, the Donora disaster in 1948 and the more recent London experiences have accelerated the research effort on the atmosphere. The most significant new information which has resulted has been the findings in regard to hydrocarbons and their reactions in the atmosphere.

The limitations on this presentation do not permit a full discussion of these findings. It is sufficient, however, to summarize the conclusive evidence. Certain hydrocarbon vapors in sunlight and stable air can oxidize to form chemically complex aerosols and vapor phase oxygenated hydrocarbons. Some of the latter are irritating to the eyes and cause damage to vegetation. The most important types of hydrocarbons which are known to play a part in this photochemical reaction are the olefinic, branched-chain and cyclic compounds, which are present in gasoline vapors. A by-product of this photochemical reaction where oxides of nitrogen are present in the atmosphere is the production of ozone, which in itself may be irritating or have deleterious effects.

Work in this field was first reported by the author to the *Air Pollution Control Association* in 1951 to invite attention of air pollution officials to the fact that these studies would open up a new area of investigation and control on a new class of contaminants. Confirmation of these findings in later years has led to an intensification of studies on the sources of hydrocarbons. Auto exhaust, diesel engines, storage tanks, plating operations and a variety of petroleum refining processes are being studied. Each of these sources of potentially harmful hydrocarbons or strong odors will ultimately be a major area of interest for every industrial community and for engineers engaged in improving atmospheric conditions.

While the work on controlling contaminants from these sources is relatively new, it is fortunate that sufficient information is available to recognize that in general, these contaminants can be removed by absorption or oxidation procedures. Consideration of this subject removes the engineer from the field of conventional designs employed in air pollution such as electrostatic precipitators, centrifugal collectors and filters. Here, the engineer is concerned with flame incineration, the use of catalysts for combustion, vapor recovery systems and absorption. Each of these adaptations requires a specialized engineering study to determine the volume of material to be handled, the nature of the contaminant, some index as to the efficiency of removal required and finally, the appropriate design for each single installation.

Journal Section

The public has shown an increased interest in the progress being made by the technician in combating air pollutants in this category. The exhausts of internal combustion engines and diesel trucks are receiving considerable attention throughout the country. During the past year, several cities including New York and Philadelphia have considered legislation to combat this growing problem. Losses in the petroleum industry heretofore ignored are being recovered to reduce not only the odors, but in some cases, the recovery more than pays for the cost of the control equipment. Several companies including employees of the motor industry are conducting research on equipment for reducing the hydrocarbons from automobile exhausts and diesel engines. Each of these problems is extremely complex and will require considerably more engineering detail experimentation than is necessary for fixed sources of air pollution.

The interest in this field has already resulted in studies to prevent this contaminant from entering air conditioning systems. It is of interest to note the increased use of activated carbon in air conditioning systems to prevent the gaseous pollutants of our industrial cities, each of which is full of hydrocarbon vapors, from entering air conditioned buildings. The early research work on hydrocarbons and their effects on plants required the use of activated carbon in the greenhouse in order to grow plants which would not be destroyed by the polluted air in Los Angeles, and thus make it impossible to have controlled plants for experimental work. As attention to this subject has increased, many researchers have found it necessary to provide laboratory air which is free of contaminants in order to carry on successful experimentation.

It is obvious that the removal of these materials can be accomplished by other means. Heating systems and air conditioning systems can utilize oxidation catalysts and absorption procedures to improve the atmospheric conditions. Studies in this field will be conducted by a number of companies throughout the United States.

The great interest in the control of atmospheric pollution today indicates the broadening of the field of environmental sanitation. The well-established nuisances, the damage to property and the implications on the impairment of health from the very complex mixture of contaminants in the air will not be tolerated much longer. When one considers the character of the pollution resulting from the changing technology and the fact that most of the metropolitan areas have reached their saturation point in population, as evidenced by the mass movements to suburban areas, there is clear indication of the necessity for cleaning up the air in order to provide a better environment. It can be easily demonstrated that the largest share of our atmospheric pollution originates from a fuel which is in common use. The increased use of gasoline and petroleum products points out the need for a more intensive effort to control the pollution originating from this fuel both indoors and in the outside air.

Control Legislation and Regulations

By H. C. Ballman

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Legislation and regulations governing air pollution control, numbering in the hundreds, have been instituted in that many cities, and several states, over the past 50 years and more recently one piece of legislation has been passed at the Federal level. Presently there is in existence a fairly recent statistical tabulation of ordinances of many cities of this country[1] which outline the requirements of legislation by expenditure and by air pollution limitations. Therefore, due to lack of published material that is conclusive in giving legislative patterns, it seems necessary to review some of the recent legislative and administrative practices of various governmental agencies.

Model Laws

Several groups have, in the past, taken the time to formulate what are known as Model Smoke Ordinances for cities and urban communities. Their purpose was to extend a format which could be followed by those desiring to write new legislation. These model ordinances have met with some measure of success but unfortunately some legislative bodies adopted these ordinances in toto without regard for local problems or local enabling powers. In other instances these model ordinances did serve a very good purpose. Today most of these model ordinances are antiquated because basic smoke programs have been extended to complex air pollution control programs and, the model ordinances have not been extended in a like manner. In other words, our models are outgrown.

There is a real need for a statement of delineation or definition on the activities which should be taken by the several levels of government, Federal, state and local, so that reasonably well-coordinated legislation may be understandingly administered at these levels. A brief review of the literature has not developed a statement of definition which could be presented to a meeting such as this for discussion. It is proposed therefore to quickly summarize present legislation in force at the several levels of government so that one may evaluate it and possibly come to some conclusions.

Basic Conditions for Sound Legislation

First, however, some limitations or boundaries for the following discussion need to be set up. Such boundaries are necessary to focus on definite arguments without going at all tangents in this very complex area of legislation and regulations. The following are somewhat axiomatic but are stated here for clarity:

1. An air pollution control ordinance, in order to have value, must be capably administered and enforced and Mr. Carter will give attention to this point.

2. (And this may be a new concept to those assembled here.) Legislation and resultant governmental activity are not too different from regular business practices. In most cases governmental activity has comparable activity in business transactions. For this reason it is helpful to think in terms of any legislation or regulations being, in a sense, a contractual obligation between two parties as, in the instance of air pollution control legislation, there is the aggrieved party and the party causing pollution. In an ordinary business transaction, all would quickly agree that both parties to the contract should show sincerity of purpose in contractual agreement by putting up some sort of earnest money, ability or effort, to show good faith in keeping the contract. This sincerity of purpose must also be carried over into legislative matters. Certainly all will agree that the potential pollution source does have a definite financial or other obligation in such a contract for it is up to the source to correct its situation, which may involve effort, ideas, money or a combination of all three. The aggrieved party who causes the legislation to be enacted, or brings it to the attention of the legislative party, also should be given the opportunity to show his sincerity of purpose in one of several ways:

a. In the instance of a private nuisance where he alone, or possibly a few persons, may be affected by a nuisance, the courts are set up so that injunctional proceedings can be instituted for relief. Certainly in such a proceeding all will agree that the aggrieved shows his sincerity of purpose in taking the necessary steps which will cost funds, effort and certainly extension of ideas to put across his reasons for believing that he is suffering a nuisance.

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[1] Statistical Tabulation of Air Pollution Control Bureaus United States and Canada (Published by *Air Pollution Control Association,* Pittsburgh, Pa.)

b. A more general problem which may be declared a public nuisance, the aggrieved should be given every opportunity to develop a program of presentation of his problem to the necessary legislative bodies, spending what funds may be necessary to obtain such legislation and giving the necessary effort that is required to follow the legislation through the legislative procedures.

Certainly with two parties to a contract showing sincerity of purpose, it is reasonable to believe that a greater measure of success can be expected from legislation so instituted.

3. An air pollution control ordinance can only be maintained through the continued wholehearted support of a sizeable segment of the citizenry who have possibly initiated it. Without this continued support, any administration of an air pollution control ordinance is doomed to eventual failure.

Any legislation, at any governmental level, which may tend to relieve any of these basic or axiomatic requirements on the parts of the parties involved, will tend to weaken the total air pollution control effort in a specific area.

Federal Legislation

Public Law 159 (passed by the last session of Congress and signed by President Eisenhower in July 1955) states in part as follows:

> BE IT ENACTED, ETC., THAT *in recognition of the dangers to the public health and welfare, injury to agricultural crops and livestock, damage to and deterioration of property, and hazards to air and ground transportation, from air pollution, it is hereby declared to be the policy of congress to preserve and protect the primary responsibilities and rights of the states and local governments in controlling air pollution, to support and aid technical research to devise and develop methods of abating such pollution, and to provide federal technical services and financial aid to state and local governments, air pollution control agencies and other public or private agencies and institutions in the formulation and execution of their air pollution abatement research programs.*

This extract which generally outlines the Federal act, if carefully read, will be found to be explanatory in its own right and certainly needs no further explanation by this writer.

State Legislation

Practically all of the 48 states have on their statute books some form of enabling legislation which authorizes the control of smoke (in most cases, and air pollution in a few instances) or general nuisances through local governmental agencies — cities, counties and districts — as a police power.

Presently 4 states have additional statutes which carry them a step further. Two states, New Jersey and Massachusetts, have air pollution control enforcement statutes in effect which indicate that the local authorities shall be the controlling authorities. However, should the local authority, for any given reason, not assume its proper responsibility in controlling air pollution in its immediate area, then the state has the authority to step in and take the controlling action. In Pennsylvania, there is a statute which enables the Health Department to investigate air pollution problems at the request of those affected by a nuisance source. Based upon such an investigation, the necessary report is made and if action is then required, it is necessary for the local group to take such action.

Oregon has a statute which empowers a commission to study the problem of air pollution, making the necessary recommendations for further consideration of state legislation. In its first report, made available in October 1954, the commission indicates that the control of air pollution is best handled at the local level, but feels that should the local level not be able to control nuisances of this sort, then it becomes the prerogative of the state to relieve the situation by helping to support such control activities. However, the report does not spell out the details of such procedure.

In the State of Washington, there is a quasi state program through the University of Washington Environmental Research Laboratory. Both Oregon and Washington are presently working toward legislation to be presented and enacted in the near future.

The foregoing specifically refers to air pollution control measures as statutes at the state level. They do not include, however, the powers extended to the State Health Departments for controlling nuisances, such as air pollution, which may become a specific health hazard. It is understood that any such health hazard nuisance is always under the direct control of the Public Health Department.

Local Governmental Agencies

Most all of the cities or urban communities of 50,000 or more population have, or are giving serious consideration to, some type of air pollution control legislation and enforcement program. Those who presently have a problem to be controlled are acting to correct just such a situation — and those presently without immediate problems are considering such legislation as will minimize future problems.

Cities and communities of smaller size may also have a serious problem. These smaller communities sometimes find it impractical financially to set up legislation which will definitely involve enforcement and the correlated costs of such enforcement.

The tabulation, previously referred to[1], indicates a range of cost from 2 cents per capita minimum to 27 cents per capita maximum. Using the upper figure of 27 cents per capita, it is quickly established that a city of 50,000 population can set up a budget equivalent of $12,500. This is a figure which would be able to support a minimum enforcement agency of well qualified personnel.

Therefore smaller communities (25,000 or less) have two possibilities: one is to increase the per capita cost of an air pollution program — a step which does not appear practical at any time in smaller communities since they usually have very difficult budgetary problems; or two, to work out a cooperative program with those sources of nuisance which require a measure of control. This last method requires no enforcement program but is based upon the active support of civic groups to accomplish a purpose. This method has been tried by a few of the smaller communities and they have had a measure of success in reducing air pollution.

Conclusions

From these generally stated legislative patterns, one can only draw a few definite statements which will yield a vague pattern. They are as follows:

1. Immediately, and for some time into the future, there will be a demand for more and more legislation to control air pollution. Most of this demand will be at the local level but from time to time demands will be placed at the level of State government and at the Federal level.

2. The Federal government definitely has a place in the air pollution problem. Its agencies should be definitely interested in research and in investigations of a general nature pertaining to problems of air pollution, but should not be interested in activities having to do with the actual control or enforcement of air pollution control programs.

3. The State governments may find it necessary to assist local governments in finding ways and means for air pollution control programs. This may involve field testing programs and recommendations at similar projects. Here again, however, every effort should be made to leave the enforcement of the control program at the local level.

4. Local governmental agencies have been, and will continue to be, the accepted control agency groups for successful air pollution programs. Policing has always been considered local authority and air pollution control ultimately yields to a policing activity.

5. An acceptable method for controlling inter-city and inter-state air pollution is presently in great demand and has yet to be devised. Many have suggested methods but none has been found too practical except the District Program as is found in the Los Angeles District, the Allegheny County District, and others. Here the control authority has the right to take action in municipalities in a given district. So far as inter-state air pollution is concerned, there is presently no effort being made to coordinate such an effort in any part of the United States.

The *Air Pollution Control Association* is presently embarked upon the development of a statement of philosophy or a recommended policy for items 1 through 4 as just listed. This development is taking place through its Legal Research Committee. Part 5 will probably have to be handled as a compact arrangement at the State level, similar to some of our present inter-state water pollution compacts. This is an area for exploration by our Legal Research Committee and it is to be expected that the committee will come up with a definite recommendation in the near future. This Legal Research Committee is composed of capable men of wide experience in air pollution problems. They realize the real demand for a clear, concise statement pertaining to the philosophy and recommended policy on legislation and regulations. It is hoped that with their statement the indefinite areas of legislative interest will be clarified.

Practical Approach to Problems

By C. W. Gruber

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Other speakers have described various segments of the air pollution problem. The purpose of the present speaker is to put before you some thoughts on how to approach the task of providing cleaner air for the people of a community.

The term *cleaner air* is meant to imply a reduction in soiling effect of air pollution in addition to an improvement in the sanitation of the atmosphere so that the people of the community can live in proximity to one another with a reasonable degree of freedom from nuisance, discomfort, and quite possibly a freedom from a general impairment to the health of the entire community.

How does a community know when it has an air pollution problem or when does an air pollution problem exist? This question was recently asked of a speaker on air pollution from an industrial concern. His reply was *an air pollution problem exists when the people complain or when local air pollution laws are violated.* This analysis is a pretty good one.

There is no such thing as absolutely pure air so that air pollution in some form or other exists in every community. In order to define the problem in more specific terms let us acknowledge that every community has polluted air in some degree but that a community enters upon a realization that an air pollution problem exists:

1. When there is a serious affect on the general health of the community reaching the proportions of disaster.

2. When the nuisance from dirt, soil, fumes and odor is beyond the tolerance of individual citizens and they become dissatisfied and express a public desire for cleaner air.

3. When the contaminants of the atmosphere have a deteriorating effect on the production capacity on one's own plant or of the neighboring properties.

The foregoing definitions may appear to be elementary but they are stated in order to focus attention on the fact that they are largely expressed in terms of human reactions to a situation. This leads to considerable difficulty in establishing the facts.

To the experienced air pollution engineer many situations can be sized up from general observations and from talking with people. However, to the untrained observer there are frequent misinterpretations of cause and effect. For example, complaints frequently are received pointing to a particular chimney smoking or to the black smoke from a passing locomotive. Upon investigation, the effect complained of is found to be fly ash or cinders. It is difficult to convince some people that the visible smoke emission is not the direct cause of the heavy grit. One might ask, *Is it of any consequence to straighten out such misconceptions in the minds of the people?* This must be done because a corrective measure on visible smoke will not of itself stop the fly ash emission.

Unless the cause and effect relationship of the air pollution of a community is obvious to the trained observer, then it becomes necessary to conduct a survey. However, this field is in its infancy with many of its paths uncharted. Experience in numerous communities has revealed that where the problem involves multiple sources in close proximity to each other the job of unscrambling the composite air pollution fall out and tracing the paths back to the source to find out who did what, when, and contributed how much is very difficult. The dollar cost of getting these answers is far beyond what most communities are willing to pay. Los Angeles County, California spent approximately $5 million in the past 5 years to find these answers. The industries in Jefferson County, Kentucky spent $100,000 in 1952-53 to find the answer and now that county, State and Federal Government are starting out on a $137,000 program to continue the study to develop more concrete facts upon which to base more definite regulations. Cleveland, New York, Cincinnati and many others include such investigative work in their regular air pollution prevention programs.

In order to set down briefly the range or classes of pollutants to be considered, they may be grouped as follows:

1. Large particulate matter, usually visible without the aid of strong magnification; includes fly ash, grit, large dusts; is measured by weight of fall in exposed containers, or is captured on sticky paper and evaluated by a variety of means.

2. Visible smoke, usually black or dark colored; measured at point of discharge by optical comparison; effect is soil; usually measured by filter paper techniques.

3. Fine particulate matter (also referred to as fumes); measured by weight per unit of gas discharge or by referring the opacity of discharge to the opacity of a column of black smoke which is darker in shade than an established standard; effect is measured by particle count, reduction in visibility, and at times by the filter paper technique.

4. Gases; measured both at the point of discharge and the resultant effect in the atmosphere by a variety of techniques such as chemical analysis, spectrographic, x-ray diffraction; measurement of effect also calls for an evaluation of the inter-reaction of gaseous pollutants in the atmosphere to form new compounds with properties different from the individual emissions.

5. Odors — (a most complex field); measured at the point of discharge and the resulting effect by human nose assisted by mechanical devices.

Now put the vagaries of the weather on top of an already complex situation and one begins to get a picture of the job the air pollution surveyor is faced with. In Cincinnati last year, a two-man team recorded over 30,000 individual pieces of data in their search to find out something about the soiling effect of the air that serves Cincinnati.

Thus, the comprehensive air pollution survey of a community is very helpful, but gathering all the facts may require many years. At times then a program must be formulated on practical experience after assembly of as much information as can be gathered within a reasonable length of time.

Decisions made at this point are most important to the community in establishing a practical approach to the solution of its air pollution problems. There is no set pattern which lights the way to cleaner air in all situations. A program can take one of the following forms:

(*a*) a voluntary civic effort sponsored by a group not a part of the community government;

(*b*) a voluntary effort fostered by the community government backed by an ordinance or regulations to give some weight to official action;

(*c*) a comprehensive program, built around an effective ordinance, enforced by an adequate staff and supported by an intelligent and enlightened personnel.

In some smaller communities a successful effort has been carried out as a civic enterprise with voluntary support. Such a program often leads to partial accomplishment with a good chance of regression as future developments create new sources of air pollution. In other words, the watchfulness ends, allowing new problems to grow to maturity requiring a recurrence of major surgery which could have been avoided with the practice of a little preventive air pollution engineering.

By far, the most successful efforts have been the adoption of programs *(b)* and *(c)*. In smaller communities, a voluntary effort may be sufficient if it is supported and guided by professionally qualified personnel, backed by legally constituted authority to give sufficient weight to decisions and policies. In larger communities the comprehensive program is necessary.

It is axiomatic that the man behind the ordinance is no less important than the ordinance itself. In fact, a common error is to spend months and sometimes years in debating an ordinance in detail arguing for this point or that without a thought being given to the matter of *who shall administer this program if it is adopted and what shall such administration cost the people of this community?* Discussion of staff, costs and policy should be injected early into any discussion of community needs in air pollution prevention. Annual expenditures for established air pollution control programs throughout this country range from a few cents per capita to as high as 50¢ per capita where the situation demands an *all out* effort.

Once a program has been decided upon and adopted by a community, consideration must be given to the establishment of indexes which will measure its progress. This is a most important point and a most difficult one. In any new program it is certain that on the first anniversary and for several years thereafter the people through the local press will ask for a report of progress. It is at this point that the soundness of the program is tested.

One of the biggest problems to be settled in the years to come is — *Can an acceptable standard be set for the quality of outdoor air?* Such a standard would be of tremendous value in setting goals in any air pollution prevention program. This question should also be of interest to heating and ventilating engineers. If such specifications were available, the design of air cleaning equipment could be approached with a great deal more certainty than it is today. There is now going on in many communities a growing number of air pollution evaluation programs and data are being accumulated every day. It remains to assemble this information, study it, and compare it with the object in view of developing air pollution facts on which to form a basis for the establishment of a standard of quality for outdoor air.

The Cleaning of Air Pollutants

By J. W. May

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In discussing this phase of the problem having to do with the removal of air pollutants, perhaps we should dwell for a moment on the contaminants which are generally present during conditions of smog, and their source of generation. Based upon the vast amount of study of the Los Angeles smog conditions, the significant offenders which contribute to the reduction in visibility appear to be dust, fumes and smoke. Sulphuric acid mist formed by the combining of oxides of sulphur with atmospheric moisture should also be added to this list. In addition to these culprits, mention should be made of aldehydes, oxides of nitrogen, certain hydrocarbons, and ozone.

Smog is a treacherous adversary. Its constituents are many and varied and frequently difficult to identify. In the Los Angeles area, for example, one of the major complaints is eye irritation and it has been assumed that a single substance was responsible for this condition, but many different constituents have been blamed from time to time. It is now felt that eye irritation is due to the combined effect of a number of contaminants, at least nine of which have been identified.

The prevention of air pollution is fundamentally a problem in source control. Progress has been made in providing more efficient operation of industrial and commercial incinerators by the installation of more effective combustion equipment; the abolishing of rubbage burning has resulted in the daily elimination of many tons of pollutants; sizable quantities of petroleum vapors and sulphur compounds are now being prevented from being discharged into the atmosphere by control equipment installed at the refineries. Since one of the major contributors to smog is particulate matter, it is axiomatic that the installation of dust control equipment has played an important part in the reduction of this type of pollution, and is no doubt destined to play an even more important roll in the future.

Industrial dust collectors cover a wide range of equipment but may be broadly classified into the following five categories:

1. *Dry centrifugal separators*, which range from the conventional cyclone to the centrifugal separators combining a dust collector and fan in a single unit. The better designed collectors are effective on particle sizes down to 10 microns and this general classification is frequently used as pre-cleaners for more effective types of collectors. Those units which combine a fan and centrifugal collector in a single unit have the added advantage of small space requirements.

2. *Ultrasonic agglomerators*, which are used in conjunction with some type of secondary collecting device. Agglomerators of this type have proven to be rather expensive and their efficiency appears to be a function of the concentration of the dust being handled.

3. *Wet collectors* (including washers, scrubbers and wet centrifugal units). The better designs of wet type collectors provide high orders of removal on particle sizes in the 1 and 2 micron range. They have the advantage of being able to handle high temperatures as well as moisture laden air. The collected material is in a wetted form which eliminates a secondary dust problem in the removal of the collected material. The chief disadvantage of wet collectors is the possibility of excessive corrosion and the vulnerability to freezing in cold climates. Washers, scrubbers, packed towers and similar adsorption devices have been used for the collection of gases and mists with varying degrees of success.

4. *Bag houses and fabric arrestors*, are effective on particles in the sub-micron ranges, and give an excellent account of themselves when handling many types of dust. In the application of a cloth arrestor, consideration should be given to the temperatures involved and the possible deterioration of the fabric. They should not be used where steam or condensation is likely to plug the filter media.

5. *Electrostatic precipitators*, which are looked upon as being high efficiency, high cost collectors. The efficiency which they will provide is a function of the velocity of the gas through the unit — which in turn is reflected in the size of the precipitator for a given volume. Consequently, where exceptionally high orders of cleaning efficiency are required on sub-micron size particles, the installation costs are high. Electrostatic precipitators are versatile with regard to the range of temperatures over which they will operate, but their use is somewhat limited by humidity conditions and the handling of relatively dry materials. High voltages used in these precipitators produce ozone and nitrous oxides which are discharged to the atmosphere.

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In any locality where smog is a problem, the best approach would appear to be to remove the pollutants at their point of generation — before they have an opportunity to be dispersed in the atmosphere. Such a policy cannot be exclusively followed, because there are other sources of contamination such as the exhaust from automobiles, fuel oil burners, mineral and earth moving processes and domestic heating systems which do not lend themselves to this type of treatment. Consequently, it is important that consideration be given to the removal of these contaminants whenever air is supplied for building ventilation.

It is standard practice to incorporate air filters in connection with the supplying of outside air for ventilation purposes, but conditions of smog create a more critical problem in which it is desirable to remove the particulate matter as well as those vapors which contribute to eye irritation and general discomfort. Air filters as such are not effective on vapors and neither are electrostatic precipitators, because there must be a finite nucleus which can be ionized. Consequently, effective equipment for smog removal should probably combine high efficiency air filtration with activated carbon for gas adsorption. The inversion which contributes to a condition of smog has by its very nature prevented the sub-micron fraction of the pollution from rising with the normal upward convection currents of air. The removal of smaller size fraction of the dust is an ever present problem during smog conditions. Viscous impingement filters, such as the disposable or permanent washable types will have little effect on removal of these sub-micron particles and consequently electronic filters, electrostatic precipitators, or high efficiency blanket types of dry media are recommended for this application. The air filter or precipitator should be installed ahead of or upstream from the activated carbon units, because it is always desirable to protect such units from clogging in order to utilize their entire life before re-activation is required.

Enforcement of Air Pollution Ordinances and Regulations

By J. H. Carter

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For 75 years cities of the United States have been enacting anti-smoke legislation. Only within the last comparatively few years, however, has any notable progress toward ridding the skies of smoke been made. This has been brought about by capable and adequate enforcement facilities. When one studies the early ordinances many of the cities adopted and notes the handful of men provided to enforce them, he wonders if much of this legislation was not enacted with tongue in cheek.

In 1924, for example, the anti-smoke enforcement staff of St. Louis consisted of a chief and four inspectors. The city then had a population of over 800,000. Now it is not the size of a city, alone, that determines the size of the enforcement staff; but these men were charged, by ordinance, not only with observing the city's many chimneys but with examining plans and issuing permits for all new boilers and furnaces, inspecting them after completion and issuing operating certificates thereon. Also it was the announced policy of the department to instruct the firemen of the city in proper methods of firing. Presumably this task also fell on these five men. Obviously they were not able to handle all this adequately.

Today it is pretty generally accepted (although not yet universally) that any kind of control legislation is futile unless backed up by a competent and well equipped enforcement organization. The difficulty and cost of enforcement should be considered while legislation is being written. Only those provisions should be included for which the community is willing to pay in enforcement. There is no rule for how large the force should be or how much it should cost. A recent compilation of enforcement data from some 50 cities in the United States and Canada (Statistical Tabulation of Air Pollution Control Bureaus United States and Canada — published by *Air Pollution Control Association*, 1952) shows that air pollution control activities cost each inhabitant as low as two cents a year in two localities and as high as $1.42 in another.

The number and complexity of duties required of the control bureau will determine its size and cost rather than the population or area of the community. Referring again to the table just mentioned, we see that nearly all the offices issue permits for installations of fuel burning equipment. In the two cities where the cost per inhabitant was only two cents a year this duty is not included. Several cities require an annual inspection of heating plants, etc. This will necessitate a larger inspector force. Some ordinances specify types of fuel permissible for use in the control area. Additional personnel will be required to enforce this provision. Most air pollution ordinances now set a limit on the fly ash loading of chimney affluents. To enforce such a clause will probably necessitate an investment in test equipment and one or two additional employees, possibly of engineer status. On the other hand, many ordinances exempt from their provisions residential property, in one case up to 6-family units. Such exemptions, if only for one and two family units, will greatly lessen the work load since the installations and inspections in these buildings far exceed those in all others. How these ordinance differences affect the size of the inspector force is perhaps best illustrated by the classic example of Rochester, N. Y., where the use of district steam and smokeless fuels, plus a seventeenth floor tower from which most of the chimneys of the city can be observed, combine to make it possible for a one man staff to handle the enforcement for a city of over 300,000 inhabitants.

In addition to the routine enforcement duties, many control bureaus are charged with — or at least given permission for — the obtaining of general atmospheric data. These activities may range from the monthly collection of precipitated dust samples in jars to much more detailed sampling and data collecting involving the use of precision instruments, meteorological apparatus, etc. The analysis and evaluation of these data are apt to require the use of a well equipped laboratory and the services of highly trained personnel. This work can hardly be described as *enforcement* although, if the need arose, it might be defended on the grounds that it is useful in measuring the results of enforcement. The urge behind most of it, however, is probably a desire on the part of control officials to learn all they can about the skies over their domains, coupled with the hope that some day, perhaps, the data they collect and those collected by their contemporaries in other localities may provide answers to some of the many still open questions.

It has been mentioned that nearly all the control offices are required to issue installation permits and inspect the work in the field after completion. The theory behind this is, of course, to prevent an increase in the quantity of pollutants in the atmosphere even though possible new sources are added. To insure this end result, particularly for the types of units that might be expected in comparably large numbers, published minimum installation standards should be provided. The advantages of these are many. In the first place, they will be drawn up with sufficient safeguards to prevent pollution or keep it to a minimum. They will act as manuals to guide unskilled workmen toward better work and they will serve as notices to the willfully careless installer that shoddy work will not be tolerated. One of their most important uses is to maintain a uniform quality of inspection. Acceptance or rejection of an installer's work is determined by reference to the published regulations — not left to the judgment of the individual inspector.

Sometimes these standards are set forth in ordinances, in many cases they are in the form of regulations adopted by the control bureau. The latter plan allows more flexibility, as revision is possible from time to time without the necessity of action in a legislative body. On the other hand, some officials may find them difficult to enforce unless they have the weight of ordinances with penalty provisions.

Nearly all control legislation now contains provisions limiting solids in the discharge from chimneys to definite numerical quantities. Tests to determine compliance or non-compliance with these standards require several hundred dollars worth of apparatus and the services of at least two skilled operators. The writer has been told by one control official that the official's ordinance contained such a regulation but that he had no knowledge of whether or not chimneys in his area were complying because no appropriation had ever been made for testing. In this case passage of the chimney dust provision was only a gesture.

One way to eliminate the necessity of having these tests made by the control bureau is to require that each plant arrange for its own test at its expense. The control office, however, will still need a man thoroughly familiar with the entire procedure so that he can observe the test while in progress and check the computation of results.

When the control ordinance specifies the kinds of fuel that can be burned in the area considerable work is demanded of the control organization. Each proposed source of fuel must be investigated and, in some cities, a list of these sources with trade names or other identification must be made public from time to time. This writer can testify to the hours upon hours of work required to compile and publish a solid fuel source list.

Often a fuel regulating ordinance also requires the annual licensing of solid fuel dealers by the control official. Handling applications for these and issuing the licenses means added work for the office.

Fuel regulations also increase the inspectors' duties. Dealers yards and trucks should have periodic checks; fuel complaints must be investigated; samples collected for analysis, etc.

In smaller communities where fuel regulations are enforced much of the foregoing can be eliminated by putting the responsibility for delivering proper fuel squarely on the shoulders of the dealer and requiring him to produce, on demand, a satisfactory analysis of any fuel in which he may be dealing.

Most air pollution control ordinances provide two means for the punishment of violators. *First,* — the sealing of offending equipment; *second,* — the assessment of fines upon conviction in misdemeanor court. Both are useful and both should be applied fearlessly and impartially when the occasions demand.

The seal is effective on devices that are operated periodically or seasonally, such as heating equipment. By sealing these units at the end of an operating period, the control official has not deprived the owners of their use when needed and, at the same time, has assured that they will not be operated again until satisfactory corrections have been made. The seal is particularly valuable in cases of emergency.

By its use a piece of offending equipment can be taken out of operation in a few minutes as against weeks, or even months, for a court case.

Court actions are generally the last resort in cases where taking a piece of equipment out of service might work a hardship through loss of production, layoffs of personnel or similar reasons. If court actions are used merely to collect fines and then send the culprits merrily on their way they are apt to be not very effective. However, use can be made of the parole system to keep an offending plant on its good behavior for an extended period and even bring about needed repairs or modernization.

For most effective enforcement the punitive provisions of an ordinance should be used sparingly and yet unhesitatingly when circumstances demand. The most willing and complete cooperation comes from those who are aware that the control official is not invoking penalties that he is empowered by law to apply, but will not hesitate to do so, promptly, once that cooperation lags.

Honored by Life Membership

C. C. Cheyney
Buffalo, N. Y.

Charles C. Cheyney, Buffalo, N.Y.— Culminating a long career with the Buffalo Forge Co., Buffalo, N.Y., C. C. Cheyney was elected vice president of sales in 1953.

Council Bluffs, Ia., was the place of his birth on March 20, 1889. He attended Cornell University, Ithaca, N.Y., receiving his M.E. in 1911.

After graduation from Cornell, Mr. Cheyney started in the engineering department of Buffalo Forge Co. Transferring to Chicago a few years later, he served as its Chicago district manager. At this time he also did experimental work for Carrier Air Conditioning Co. His Chicago stay was interrupted by service with the U. S. Navy Air Corps as an aircraft engineer during World War I.

He returned to Buffalo in 1928 and was made assistant sales manager of the Buffalo Forge Co., advancing to sales manager in 1945. Mr. Cheyney was elected a director of the company in 1945.

James J. Hayes, Chicago, Ill.— Over 42 years with one organization, J. J. Hayes is now serving as vice president of the Stannard Power Equipment Co., Chicago. He first became connected with that company in 1913, as a service engineer and junior sales engineer.

A member of the Society since 1920, he served as the president of the Illinois Chapter in 1937. He also held all the other positions as officer of that chapter.

Mr. Hayes has been in Chicago throughout his life. He was born there on October 18, 1890 and is a graduate of the mechanical engineering department of Armour Institute of Technology, now called Illinois Institute of Technology. He gained his M.E. in 1913, the same year he joined the Stannard Power Equipment Co.

J. J. Hayes
Chicago, Ill.

The President's Page

Regional Operations Plan

PROBABLY one of the most significant steps in the operation of the Society came into existence at the 62nd Annual Meeting held in Cincinnati, where the membership approved revisions of the By-Laws for a plan of operating the chapters on a regional basis.

The idea for this plan, which is primarily intended to strengthen the ties between the chapters and the Society, was developed during years of study by several committees assigned the responsibility for planning the growth and progress of the Society and its chapters. The gradual increase in the membership rolls and in the number of chapters, emphasized the advantages that could accrue from operating the chapters on a regional basis. In the 20 years immediately preceding the adoption of the plan, the rapid Society growth included an increase in membership from approximately 1800 to over 10,000 and an increase in the number of chapters from 20 to 61.

Previous to the adoption of this plan at the Cincinnati Annual Meeting, integration of the chapters into the overall operation of the Society was accomplished through the headquarters office, various Society committees, the Nominating Committee and by visits of Society officers to each chapter. To implement these ties for further Society growth, the amended By-Laws permit the Council to establish regional boundaries, provide for the election of 7 Regional Directors by the membership, and the creation of Chapters Regional Committees, composed of designated members from each chapter. Each Chapters Regional Committee meets once a year at a regional area meeting to consider suggestions for improving Society policies, procedure and operation.

The Council continues to select 4 Members and 2 Alternates to the Nominating Committee, but under the new plan, each of the 7 Chapters Regional Committees selects one Member and 2 Alternates for the Nominating Committee.

Until such time as the plan is allowed to move into full action, the new Council at its January 26 meeting, appointed Regional Directors, fixed regional boundaries and selected locations and dates for the spring meetings of the Chapters Regional Committees according to the following schedule:

REGION NO.	REGIONAL DIRECTOR	LOCATION & DATE CHAPTERS REG. COM. MTG.	AREA IN REGION
1	John Everetts, Jr.	HARTFORD, CONN. May (date to be announced)	Maine,. New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, New Jersey, and Delaware
2	C. H. Pesterfield	TOLEDO, OHIO April 2, 1956	Ohio, Indiana, Illinois, Michigan, and Wisconsin
3	John E. Haines	OMAHA, NEB. May 8, 1956.	Minnesota, North Dakota, South Dakota, Montana, Wyoming, Colorado, Nebraska, Kansas, Iowa, and Missouri
4	A. J. Hess	PORTLAND, ORE. February 17-18, 1956	Idaho, Washington, Oregon, California, Nevada, Utah, and Arizona
5	C. B. Gamble	ATLANTA, GA. March 12, 1956	Maryland, District of Columbia, Virginia, West Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana (except Shreveport)
6	D. M. Mills	DALLAS, TEX. March 19, 1956	Arkansas, Oklahoma, New Mexico, Texas, and Shreveport, La.
7	J. H. Fox	TORONTO, CANADA April 9, 1956	The Provinces of Canada

The membership will be interested to learn that the Charter for the 62nd chapter of the Society was granted to an Edmonton group in Canada and is to be known as Northern Alberta Chapter. The Charter Meeting for this chapter was held on February 22.

John W. James

President

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS

Nuclear and Solar Energy Discussed at Portland Conference

Left to right — Dick Blankenship, President, Oregon Chapter; John W. James, President, ASHAE; P. B. Gordon, First Vice President, ASHAE; and J. P. McDermott, General Chairman of Arrangements

FEBRUARY 17 and 18 in Portland, Ore. were devoted mainly to the discussion of heating and cooling problems involving the use of nuclear and solar energy, at a two session conference in the Columbia Athletic Club, sponsored by the Oregon Chapter of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS.

The total registration was 175, including 115 members of the Oregon Chapter, Society officers John W. James, Chicago, Vice Presidents P. B. Gordon, New York, and Prof. E. R. Queer, University Park, Pa., Executive Secretary A. V. Hutchinson, New York, Regional Director, A. J. Hess, Los Angeles, and members of the chapters of the Society's Region 4 and several from Vancouver, B. C.

At the opening conference session J. Donald Kroeker, program chairman, introduced Dr. S. M. Shelton, U. S. Bureau of Mines, Albany, Ore., who conducted the session.

The Field of Nuclear Energy and Its Future was described by Dr. E. T. Hayes of the U. S. Bureau of Mines, Albany, Ore.

Wilfrid E. Johnson, Hanford, general manager of General Electric Co. atomic products operations, discussed Nuclear Reactors and Their Application and stated that the unpredictability of the future market for fission-produced plutonium has made development of an electric power-plutonium nuclear reactor by private industry "unattractive economically."

Besides, Mr. Johnson pointed out, the tremendous capital investment needed for such a development would be a risky venture when you consider it would take at least five years to build such a plant and two years after that the bottom might drop out of the plutonium market.

Conventional fuel costs in the United States are so low that they are a disadvantage in the development of atomic power, he said. But, on the other hand, this country has the advantage of a large market for power.

Regardless of problems now facing atomic power development, Mr. Johnson said, it still may be one of the strongest forces for peace.

The Second Conference Session, held on February 18, was devoted to solar energy for heating.

Patrick Dowling, manager of the Portland office of Stanford Research Institute, acted as chairman and discussed the economical potentialities of solar energy and their place in our future. He gave an inventory of energy sources which runs into awesome quantities, and is as follows: coal, listed in trillions of tons; petroleum, given in billions of barrels; oil from shale, even bigger billions of barrels; natural gas, trillions of cubic feet; water, trillions of horsepower hours per year; uranium and thorium, twenty times more energy units than from fossil fuels. He stated that, because of our staggering energy consumption, coal may last for 200 years, and gas and oil only a few dozen decades. Solar energy must be explored because of its vastly greater potentiality than any of the energy sources presently being utilized, he added.

In considering solar heating, Mr. Dowling said that, at the present time, a home located high in the mountains would be a prospect for such an installation and this would probably cost about $4000 today. Since, in the future, the same collector would be designed to cool as well as heat, it seems fairly certain that the investment would be considerably reduced. Mr. Dowling stated that, in the long run, solar energy may be needed to supply the bulk of our energy requirements.

A film, entitled "In the Sun's Laboratory," showed some of the solar energy activities in the USSR.

Dr. George O. G. Lof, Denver, Colo., discussed a series of solar heating and cooling systems and described the solar energy available in the U. S. during winter and summer seasons. He showed on the screen various types of flat plate solar collectors and gave a summary of principles and techniques. He briefly described six solar heating experimental homes in various sections of the country. He also mentioned the planned installation at MIT and another house being built in Denver. He made a few observations on the future prospects of solar heating and solar cooling.

Dr. Robert Eustis, Palo Alto, Calif., described the design and performances of solar collectors, and Robert H. Dietz, Seattle architect, discussed architectural considerations in the design of solar heating.

At 6:30 p.m. on Saturday, February 18, the members of the Oregon Chapter and conference guests assembled for a banquet which included a good attendance of the ladies. Bert W. Farnes, Portland, a member of the Society's Council, served as toastmaster. Following dinner, a brief talk was given by P. B. Gordon, First Vice President of the Society, on the evaluation of the first chapters regional meeting. The principal talk, Our Society and Its Future, was given by President John W. James.

Following Mr. James' talk, John P. McDermott, acting as narrator for a sketch, the cast being selected from the audience, portrayed the difficulties of two couples who are having troubles with their new "nuclear and solar air conditioning plants."

Region 4 Holds First Chapters Regional Meeting

REGIONAL
DIRECTOR

Left to right — Frank W. Jenkinson, secretary, Chapters Regional Committee for Region 4; A. J. Hess, Los Angeles, Regional Director

The members and alternates appointed by the eight chapters in Region 4 assembled at the Columbia Athletic Club, Portland, Ore., February 17 with Arthur J. Hess, regional director, presiding. Those present were J. P. Sorensen, Phoenix; J. I. Sprott, San Francisco; V. W. Thornburg, Sacramento; J. L. McCullough, Los Angeles; N. R. Norte, Portland; G. E. Wright, Jr., Salt Lake City; L. F. Christofferson, Seattle; and Max Tonn, Spokane.

F. W. Jenkinson, Spokane, was elected secretary of the committee. Chairman Hess requested the chapter representatives to suggest subjects for chapters' agenda. The first four questions were proposed by the Oregon Chapter. Others were discussed briefly and were referred to the Regions Central Committee for consideration.

At the mid-day luncheon, John P. McDermott, general chairman, presided. Principal speaker was First Vice President P. B. Gordon, New York, who discussed the philosophy of the plan for the regional operation of chapters.

On Saturday morning, the second session of the chapters regional meeting was held and one member and a first and second alternate were elected to serve on the nominating committee for 1957. A discussion of chapter operational programs was invited by Mr. Hess and John L. McCullough, Los Angeles, discussed the technique of planning chapter meeting programs. A. V. Hutchinson, Executive Secretary, spoke briefly on methods of maintaining chapter minutes and records.

Bert W. Farnes, Portland, Ore.

J. Donald Kroeker talked about chapter publications and publicity and discussed the procedures used and the benefits gained from chapter publications. Cornelius Van Boeyan, Vancouver, talked on chapter dues and finances and Bert W. Farnes, Portland, outlined the Society membership program and urged that chapter membership committees stress the value of Society membership and select candidates from eligible engineers who were well-established in the field.

Pat I. L. Winsor, Seattle, discussed the design of meeting announcements and how they could be most effective. Thomas E. Taylor, Portland, talked on the importance of well-equipped meeting places and the importance of dinner meetings. Max Tonn, Spokane, spoke on the methods of getting good meeting attendance.

At the mid-day luncheon, Ed Lokay, Portland, acted as toastmaster and the featured speaker was Elmer R. Kaiser, Cleveland, Director of Research of the Society. His subject was The Society's Research and You.

Oregon Chapter Meeting

On Friday evening, February 17, the Oregon chapter members and guests enjoyed a social hour beginning at 6:30 p.m. at the Columbia Athletic Club. Following dinner, Chairman Blankenship, Chapter president, introduced Prof. Elmer R. Queer, Second Vice President of the Society, for a talk, Engineers and Their Relationship to People. The air conditioning of aircraft was the subject of a technical paper by F. H. Green, Los Angeles.

T. E. Taylor, Portland, Ore.

Historical Washington, D.C.

Site of Society Semi-Annual Meeting 1956

The Semi-Annual Meeting 1956 of the Society will be held in The Shoreham, Washington, D.C., June 18, 19, and 20. Consisting of 7 sessions, the Semi-Annual Meeting will be officially opened on Monday morning, June 18, by Pres. John W. James. The Program and Papers Committee, W. A. Grant chairman, has selected 14 papers and arranged 2 symposiums for the technical features, and the Washington, D.C. Chapter's Committee on Arrangements has completed preliminary plans for various interesting special events for both members and ladies. These events will include sightseeing trips to Mt. Verion, Washington's birthplace; the Federal Bureau of Investigation; Arlington National Cemetery; and inspection trips to David Taylor Model Basin, National Institute of Health, and the Naval Ordnance Laboratory; and a luncheon and fashion show for the ladies.

Technical Papers

Some of the technical papers will represent thinking on subjects such as indirect water heaters, snow melting systems, solar energy, intermittent heating and cooling, and temperature and humidity effects on odor perception. One symposium will be on codes and standards with C. H. Pesterfield in charge of arrangements, and the other one will be on residential air conditioning with W. A. Grant in charge of arrangements.

Welcome Luncheon

P. R. Achenbach, general chairman of the Committee on Arrangements, has announced that the Entertainment Committee, under the chairmanship of J. H. Broome, has secured Brigadier General T. A. Lane, engineering commissioner for the District of Columbia, as the speaker for the Welcome Luncheon on Monday. Mr. Broome's committee has also made arrangements for a very pleasant Monday evening in the Outdoor Terrace dining room of The Shoreham where there will be dinner, dancing and entertainment.

Golf Tournament

The ASHAE Golf Tournament will be held Monday afternoon with contests for the Past Presidents' Research Bowl, the Eichberg Memorial Cup, and the Paul Bunyan Cup.

On Tuesday there will be a sightseeing trip to Washington's birthplace for the ladies and children. The trip to Mt. Vernon will be by boat, providing an opportunity to enjoy some picturesque scenery. The return trip will be by bus with a stop off at Arlington National Cemetery in time to see the changing of the guard.

Foreign Embassies

Other events planned by the Ladies' Committee include a tour through the Federal Bureau of Investigation, a visit to the embassies of Pakistan and Egypt, and a luncheon and fashion show. A White House tour is also planned.

Sightseeing

The nation's capital offers unlimited possibilities for members and their families to secure a first-hand view of many phases of the Federal Government and also visit the numerous historical and traditional points of interest. Those visiting Washington, D.C. for the first time will certainly want to see the Capitol, the White House, Washington Monument, the Lincoln and Jefferson Memorials, to mention but a few of the well-known places. In addition there are others such as the Library of Congress, the Smithsonian Institution, the Building of Printing and Engraving, and the Archives.

Attendance at the Semi-Annual Meeting this summer not only will prove beneficial through the information gained by attendance at the various sessions, but an opportunity to visit Washington, D.C. also will give the family a special summer vacation. Plan now and make your arrangements early. A special announcement with reservation forms for hotel accommodations and special events will be mailed to all members in March. Reserve the dates June 18-20.

ADVANCE PROGRAM

Semi-Annual Meeting 1956

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS
June 18-20, 1956
The Shoreham, Washington, D.C.

Monday — June 18

9:00 a.m. REGISTRATION (*Main Lobby*)
9:30 a.m. FIRST SESSION (*West Ballroom*)
Call to Order — Pres. John W. James
Greetings by P. R. Achenbach, Chairman Committee on Arrangements
Comparative Performance of Indirect Water Heaters, by L. L. Hill and W. S. Harris
Natural Convection and Radiation In A Panel-Heated Room, by T. C. Min, L. F. Schutrum, G. V. Parmelee and John Vouris
10:00 a.m. Ladies' Sightseeing Trip to Federal Bureau of Investigation
12:00 p.m. WELCOME LUNCHEON (*Blue Room*)
Speaker: Brig. Gen. Thomas A. Lane, Engineer Commissioner, Dist. of Columbia
1:00 p.m. Golf Tournament (*Congressional Country Club*)
1:30 p.m. Inspection Trip — David Taylor Model Basin
2:00 p.m. Ladies' Sightseeing Trip to Embassies of Pakistan and Egypt
7:00 p.m. Get-Together Party (*Shoreham Terrace*)

Tuesday — June 19

9:00 a.m. REGISTRATION (*Main Lobby*)
9:30 a.m. SECOND SESSION (*Main Ballroom*)
Call to Order — Vice Pres. P. B. Gordon
Heat Requirements of Snow Melting Systems, by W. P. Chapman and Samuel Katunich
Small-Pipe Perimeter Heating In A Residence, by D. R. Bahnfleth, H. T. Gilkey and C. F. Chen
9:30 a.m. THIRD SESSION (*West Ballroom*)
Call to Order — Vice Pres. E. R. Queer
Air Velocities In Two Parallel Ventilating Jets, by Alfred Koestel and J. B. Austin, Jr.
Dependence of Water Vapor Permeability On Temperature and Humidity, by S. C. Chang and N. B. Hutcheon
Effect of Unbalanced Air Pressure on Permeance, by F. A. Joy and D. R. Fairbanks
12:15 p.m. Inspection Trips:
(a) Naval Ordnance Laboratory
(b) National Institute of Health
Bus trip; Dutch Treat Luncheon in Cafeteria
1:00 p.m. Ladies' Sightseeing Trip to Mt. Vernon (*Boat and Bus*)

Wednesday — June 20

9:00 a.m. REGISTRATION (*Main Lobby*)
9:30 a.m. FOURTH SESSION (*West Lobby*)
Call to Order — Pres. John W. James
Laboratory For Solar Energy Study at Minnesota, by R. C. Jordan and J. L. Threlkeld
Intermittent Ground Grids For Heat Pumps, by G. S. Smith
Intermittent Heating and Cooling of Buildings, by P. L. Pfennigwerth and Merl Baker
9:30 a.m. FIFTH SESSION (*West Ballroom*)
Symposium on Codes and Standards — C. H. Pesterfield
12:00 p.m. Ladies' Luncheon and Fashion Show (*Sheraton Park Hotel*)
2:00 p.m. SIXTH SESSION (*Main Ballroom*)
Call to Order — Vice Pres. P. B. Gordon
Performance of One-Row Tube Coils With Thin-Plate Fins, Low Velocity Forced Convection, by D. G. Shephard
Temperature and Humidity Effect on Odor Perception, by W. F. Kerka and C. M. Humphreys
The Indirect Evaporative Air Cooler, by J. R. Watt and R. A. Bacon
2:00 p.m. SEVENTH SESSION (*Main Ballroom*)
Symposium on Residential Air Conditioning — W. A. Grant
Report of Resolutions Committee
Unfinished Business
New Business
Adjournment
6:30 p.m. Social Hour
7:00 p.m. SEMI-ANNUAL BANQUET (*Terrace Banquet Room*)

Eight Sessions at 62nd Annual Meeting

John E. Haines, Minneapolis, Minn.
President

John W. James, Chicago, Ill.
President-Elect

WITH a total of eight technical sessions during the three days of the 62nd Annual Meeting, the program was one of the most ambitious ever undertaken by the Society. Concurrent sessions were programmed for each day and all attracted a large attendance. The Committee on Arrangements for the Cincinnati Chapter, under the leadership of A. W. Edwards as general chairman, functioned so efficiently that all events moved with precision including the program for the ladies and the social events. Attendance figures included: Members 511; Guests 144; Ladies 157. While not one of the largest meetings on record from the standpoint of registration, the sessions at the 62nd Annual Meeting were extraordinarily well attended.

First Session, Monday, January 23, 10:00 a.m.

After opening the first technical session in the Ballroom of the Sheraton-Gibson Hotel, Pres. John E. Haines, Minneapolis, Minn., called upon A. H. Gerdsen, president of the Cincinnati Chapter who briefly outlined the features of the program and welcomed the members. President Haines then introduced Mr. Edwards, who called attention to the program features and urged that all present arrange to take part in the social events on the program. President Haines then announced that the Committee of Resolutions would be made up of John Everetts, Jr., Philadelphia, Pa., R. A. Sherman, Columbus, Ohio, and W. J. Collins, Jr., Oklahoma City, Okla.

As the next order of business, President Haines presented his report in which he outlined many of the important events which took place during the course of the year.

Report of President

During the past year the Society has shown continued growth and has progressed at an accelerated rate. The many committees have been unusually active and their accomplishments will assist in advancing the arts and sciences of heating, ventilating, cooling, and air conditioning for many years to come.

Our improved publicity and public relations program has provided people with a better knowledge of what the Society does and a greater appreciation of what is being done by so many Society members for the advancement of the profession.

For the first time the membership of the Society exceeds 10,000, and the new chapters in Western Massachusetts and in Baton Rouge have increased the total number of chapters to 61.

During the past two years I have had the distinct pleasure of visiting 56 chapters, the Canadian Conference, the Oklahoma Regional Meeting, 11 Council Meetings, 63 Committee Meetings and have represented the Society at 8 conventions and other functions of other societies and associations. To do this I have traveled more than 123,000 miles.

All of these chapters, without exception, are growing in size, broadening their activities, and providing greater benefits for their members and their communities. The Canadian Conference and the Oklahoma City Regional Meetings were very successful, and the committee meetings were all well attended and well planned. It is very encouraging.

The need for and the installation of air conditioning continues to grow and grow. The air conditioning industry as a whole reached an estimated sales volume of 2½ billion dollars in 1955, it is expected to approach 3 billions in 1956, and should reach a sales volume of 6 billions in 1965.

Journal Section

Although heating in some form has been in use for several thousand years, and air conditioning has been practiced for more than 50 years, our profession is comparatively new, and there are still many fundamentals to be determined.

As a result of research and the proper dissemination of the information gained from research, heating and air conditioning will be much better and more efficiently accomplished in the future.

Incoming Pres. John W. James is inducted into office by Retiring Pres. John E. Haines with Mrs. James at right

John E. Haines receives Past President's Award from Past President Hunter

The research program and other activities of our Society provide the means for determining these fundamentals and of disseminating this information in a manner which permits practical application.

Here are a few of the significant events which have happened during the past year.

The Councils of ASHAE and *ASRE* voted to hold a joint meeting in Minneapolis in June of 1958. This is the first joint meeting of the two Societies for many years.

A monthly news-bulletin is being sent to the officers of each chapter by the New York headquarters which provides information concerning Society, chapter, and membership activities.

New reference forms for obtaining information on candidates for membership and advancement including a copy of the candidate's application were put into use.

The Society subscribed to the *Canons of Ethics for Engineers* as prepared by the Engineers' Council for Professional Development and published these canons in the Journal.

The Council proposed the following By-Law changes in order to improve the operation and expand the accomplishments of the Society:

1. That the Guide Committee be appointed on November 1st of the previous year instead of at the Annual Meeting in order that the committee may have this additional time to make the necessary revisions and additions to The Guide.

2. That the membership grades be changed to correspond with the recommendations of the *Engineers' Council for Professional Development*. The proposed changes provide that the grades of membership shall be: Honorary Members, Presidential Members, Life Members, Fellows, Members, Associate Members, Affiliates, and Students. This change proposes to eliminate the grade of Junior Member and add the grade of Fellow with revisions in the qualification requirements of all of the grades of membership.

3. That a Regional Plan for Chapter Operations be established providing for 7 regions, each with a Regional Director and a Chapters Regional Committee; a Regions Central Committee; and other proposed changes which should materially improve the Society benefits to chapters and members.

4. That the procedure for processing Student Member applications be simplified so as to encourage an increase in the number of Student Members.

5. These proposed By-Law changes were presented to the membership at the Semi-Annual Meeting of the Society in San Francisco in June of 1955 and the results of the proxy ballot to be announced at the Annual Meeting.

6. The Council approved membership of the Society in the *Engineers Joint Council*. The Joint Council membership is made up of national engineering societies and its major objectives are to promote cooperation among the various branches of the engineering profession and to advance the science and profession of engineering.

7. A budget amounting to approximately $600,000 was approved for the fiscal year starting November 1, 1955, of which $223,000 was allocated to the research program.

8. Subject to the adoption of the new By-Laws pertaining to the Regional Plan for Chapter Operations, the Council has selected the dates for 7 Regional Chapters Committee Meetings to be held during February, March, April, and May in Portland, Ore., Atlanta, Dallas, Toronto, Toledo, Omaha, and Hartford.

9. The growth of membership and the increase in the number of chapters has required a corresponding increase in the headquarters staff and the space which they occupy. Therefore, the Building Committee has arranged to rent additional space on another floor of the building now occupied by the staff at 62 Worth Street in New York.

10. The research program includes more than 20 projects. The fact that there are 43 percent more companies and associations contributing to the research program today than a year ago has permitted the expansion of the program and the research staff.

11. One of the new research projects started during the past year is a re-study of comfort conditions which will include all of the elements affecting human comfort. These studies will supplement the very valuable fundamental data on human comfort which resulted from the research of the Society several years ago.

12. Following completion of these comfort studies a project is being prepared to determine the effect of the thermal environment on the efficiency and productivity of office and factory workers, on the learning rate of students, and on the health of human beings.

We should all be very proud of our Society's research accomplishments and look forward to the future accomplishments of our continually expanding research program.

Last year, 20 chapters were issuing publications of various sorts ranging from one to several pages. These publications contain announcements of the next meeting, a report of the previous meeting, local chapter news, national Society news, news about the members and other items of interest.

A check on the readership of these publications indicates that nearly every word is read by every chapter member. Therefore, these publications provide a service for the members which increases their interest in chapter and Society affairs.

Several chapters are assisting local and state authorities in writing heating, ventilating, and air conditioning codes. This is not only permissible, but very desirable when a request is received from the proper authority.

But in spite of all these accomplishments we must not be complacent. As our mem-

AMERICAN SOCIETY
of
HEATING & AIR-CONDITIONING
ENGINEERS

Newly elected three-year Council Members are introduced by Past Pres. M. F. Blankin (at microphone) with Retiring President Haines. (Standing): A. B. Algren, J. N. Livermore, John Everetts, Jr., and J. H. Ross. (Seated) Mrs. L. N. Hunter, President-Elect James, Mrs. John E. Haines, The Reverend Laurence Hall, guest speaker at the Annual Banquet

bership and number of chapters grow, and as the heating and air conditioning industry grows and progresses, we face additional problems and responsibilities. I am going to mention a few of them.

There are many who believe that the technical programs at our Annual and Semi-Annual Meetings can be improved so that they are more interesting and valuable to a greater percentage of our membership. This is being studied by the Program and Papers Committee and the program at this Annual Meeting is this committee's first major attempt to improve our meetings.

We must do something about THE GUIDE because it is becoming too bulky to permit the addition of some very valuable information. Reducing the bulk of THE GUIDE brings up many practical and difficult questions such as: should the material be condensed; be published in two volumes; be in text book style; or be arranged as a handbook. This whole subject has been studied for some time by the Long Range Planning Committee. The committee has proposed that the page size of THE GUIDE be increased to 8-½ by 11 in., that we continue to publish it in the single volume form once each year, and that the material be condensed wherever practicable.

We need more usable codes and standards. Other societies have taken the lead in writing codes and standards pertaining to heating, ventilating, cooling and air conditioning, and we seem to withdraw more codes and standards than we issue. The chapters require advice and help in assisting governmental and other agencies in writing codes. We must do something about this situation, and this is being studied by the Standards Committee.

The Membership Committee is working on a plan to obtain more qualified members. The committee estimates that there are at least 100,000 people who qualify for active membership in our Society. This committee has recently issued a revised section of the Manual for Chapter Operations to assist the Membership Committees of the chapters.

Our Society has recognized the importance of publicity for many years and has obtained important and valuable publicity in newspapers and in scientific and engineering journals. This has helped considerably, but the public and many of our own members do not know and appreciate the purposes, activities, accomplishments, and future plans of the Society. This is being studied by the Public Relations Committee and a number of recommendations have been made.

We need a definition of air conditioning which will provide for a complete description of what is meant by air conditioning but which can be understood by both engineers and the general public. The fact that there is so much disagreement about the definition of air conditioning points up the necessity of an agreement among ourselves. The Standards Committee is making a study of this and has proposed a new definition for consideration.

We all know that many inadequate heating, ventilating, cooling, and air conditioning systems are being installed in all parts of the country. There are a number of reasons for this, but perhaps it is mostly due to a lack of understanding by architects and owners of what constitutes adequate heating and air conditioning, and the indifference of some manufacturers, contractors and engineers in doing a conscientious job.

Our Society has a responsibility to educate its members, the architects, and the general public through publication of definitions, codes and standards, and by its public relations efforts to help create the desire for adequate heating, ventilating, cooling and air conditioning wherever people live, work or assemble.

This is a long range project, but in the meantime as engineers and Society members we should insist that we give the general public what they have every right to receive; that the heating and air conditioning systems which we design, manufacture and install meet the requirements, whatever they may be.

In conclusion, I want to express my most sincere thanks to the other officers, to members of the Council, and to the members of the many committees and their chairmen for their wholehearted effort and cooperation, and for the time that they have spent during the past year in advancing the objectives of our Society.

In particular I want to thank the Executive Secretary and the headquarters staff for their cooperation and guidance throughout the year. It has been invaluable.

I also want to express my appreciation to the chapter officers and to the membership for their many contributions. We receive a return for our membership only as the result of the contributions which we are able to make.

It has been a privilege to be your President during the past year.

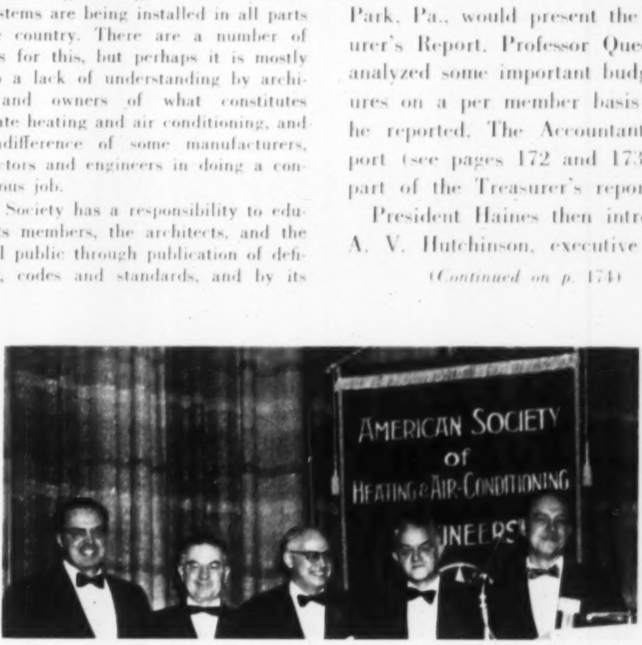
Respectfully submitted,
JOHN E. HAINES, *President*

Report of Treasurer

President Haines then announced that Treas. E. R. Queer, University Park, Pa., would present the Treasurer's Report. Professor Queer had analyzed some important budget figures on a per member basis which he reported. The Accountant's Report (see pages 172 and 173) is a part of the Treasurer's report.

President Haines then introduced A. V. Hutchinson, executive secre-

(Continued on p. 174)



Past Pres. L. N. Hunter (left) presents incoming officers Second Vice Pres. E. R. Queer, First Vice Pres. P. B. Gordon and Treas. R. E. Sherman to Retiring President Haines for induction into their new offices

Accountant's Report

Frank G. Tusa & Co., Certified Public Accountants
37 Wall St., New York 5, N. Y.

American Society of Heating and
Air-Conditioning Engineers, Inc.
62 Worth Street
New York, N. Y.

Gentlemen:

Pursuant to your request, we have completed our examination of the books of account, the financial data pertinent thereto, and the records of the American Society of Heating and Air-Conditioning Engineers, Inc. — New York, N. Y. and Cleveland and its related funds for the fiscal year ended October 31, 1955 and submit herewith our report.

The audit covered a verification of the Assets and Liabilities as of the close of business October 31, 1955. For the fiscal year then ended, the recorded cash receipts were traced into the depositories; the cancelled bank checks were inspected and compared with the record of cash disbursements, and the disbursements were supported by payment vouchers. The dues from members and the interest from investments were accounted for.

A Balance Sheet reflecting the financial position of the Society as of the close of business October 31, 1955 is submitted herewith and your attention is directed to the following comments thereon:

Cash

The Cash on Deposit was verified by direct communication with commercial and savings banks and the balances reported to us were reconciled with those reflected by the books of the Society. A schedule of cash is included as a part of this report.

Checks representing the cash on hand for deposit were inspected by us and the cash on hand was counted.

Marketable Securities

The securities shown on the subjoined schedule were verified by direct communication with the Bankers Trust Company, where same are deposited for safe-keeping. Securities have been included in the accompanying balance sheet at the cost of acquisition plus the accumulated and accrued interest earned thereon.

Accounts Receivable

Trial balances taken of the membership dues receivable and sundry debtors as of the close of business October 31, 1955 were classified and aged as follows:

Membership	1955.
Members	$ 4,384.63
Associates	3,073.00
Affiliates	4,868.95
Juniors	2,087.01
Students	7.00
Total	$14,420.59
Sundry Debtors	
Unpaid charges made during 1955	$ 7,163.97

After writing off all receivables known to be uncollectible, it is our opinion that reserves for dues and accounts receivable doubtful of collection reflected in the accompanying Balance Sheet are ample to cover collection losses that may be incurred.

Research Fund Accounts Receivable

The balance due to the Research Fund from the Society as at October 31, 1955 represents the unpaid balance of 40% of the dues receivable from members, associates and affiliates as of such date.

Inventories

The following inventories were verified either by physical count or direct communication.

Transactions	$ 8,829.97
Emblems	1,565.24
Guide Paper	386.49
Total	$10,781.70

A schedule of Transactions inventories follows:

Volume	Year	Quantity	Price	Amount
1-54	1895-1948	4,866	$ .4000	$1,946.40
55	1949	262	2.0200	529.24
56	1950	679	2.0800	1,412.32
57	1951	695	2.2750	1,581.12
58	1952	112	1.7960	201.15
59	1953	648	2.0060	1,299.88
60	1954	900	2.0665	1,859.86
Total				$8,829.97

Deposits Recievable

The deposit placed with the United Airlines in the sum of $425.00 was verified by direct communication.

Advances

The indebtedness from employees in New York and Cleveland represents advances to the employees retirement plan in the sums of $3,643.46 and $1,339.77 respectively.

Deferred Charges

The following prepayments have been deferred to future operations:

HPAC — Subscriptions	$2,982.68
Insurance Premiums — Cleveland	3,503.49
Insurance Premiums — New York	260.32
Total	$6,746.49

Permanent Assets

The Land and Buildings, Instruments, Equipment and Furniture and Fixtures are reflected on the Balance Sheet at cost of acquisition. With the exception of land and buildings all assets have been depreciated at the rate of 10% per annum. During the year fully depreciated Furniture and Fixtures in the amount of $324.47 was written off against the reserve.

In accordance with the resolution adopted by the council at its meeting of January 23, 1949 depreciation was not provided on the buildings for the current fiscal year.

Deferred Income

The prepaid dues and initiation fees by members and candidates for membership have been deferred to future operations. The membership classification of the dues prepaid by elected members follow:

Membership	Amount
Members	$23,915.68
Associates	8,362.15
Affiliates	1,697.50
Juniors	1,090.07
Students	19.50
Total	$35,084.90

Reserve for Transactions

The unexpended balance of $13,962.43 as reflected at October 31, 1954 has been completely applied to the cost of Transactions Volume 59 printed during the year.

Transactions Volume 60 was also printed during the year so there was no necessity for any Reserve as at the end of the current fiscal year.

Reserve for Building Maintenance

On October 31, 1952 the Council voted:

"That disbursements be made from the Building and Maintenance Reserve Fund as authorized by the Building Committee for major items of repair and maintenance, but any balance remaining in the fund beyond the expenditures for each year would go into reserve until the Building Maintenance Reserve Fund reached a total of $10,000.00."

The Fund had a balance at the beginning of the current fiscal year of $3,738.00. An additional $2,000.00 was provided in the budget for the current fiscal year. No major repairs chargeable to this Fund were made during the year.

Funds

There is included as a part of this report an analysis of Funds reflecting the changes that occurred therein during the fiscal year ended October 31, 1955.

Insurance

The insurance coverage of the Society follows:

Fire		
Building (Cleveland)		$201,000.00
Personal Property:		
Cleveland	$104,000.00	
Printers	15,000.00	
New York	25,500.00	144,500.00
Sprinkler Leakage		
Waverly Press	10,000.00	
Hawes and Petit	2,000.00	12,000.00
Non-Ownership — Automobile — Comprehensive		
Public Liability		100/300M
Property Damage		25M
Medical		1M
General Public Liability — Premises		
New York and Cleveland		
Liability		100/300M
Bodily Injury		25/100M
Commercial Blanket Bond		
All employees including the President, Treasurer and Chairman of the Finance Committee.		$20,000.00

Respectfully submitted,
FRANK G. TUSA & CO.
Certified Public Accountants

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, INC. — New York, N. Y., October 31, 1955

BALANCE SHEET

ASSETS

GENERAL FUND			
Society Assets (Per Schedule)			$ 68,293.18
Research Assets (Per Schedule)			81,594.39
PROPERTY FUND			
Land and Buildings	$84,920.96		
Less: Reserve for Depreciation	3,908.07	$81,012.89	
Laboratory and Equipment	76,726.43		
Less: Reserve for Depreciation	47,360.47	29,365.96	
Furniture and Fixtures (N.Y.)	19,190.98		
Less: Reserve for Depreciation	7,944.19	11,246.79	
Library (Cleveland)		300.00	
Tools (Cleveland)		300.00	122,225.64
BUILDING FUND			
Cash on Deposit		1,024.57	
Securities			
At Cost	37,164.00		
Add: Accumulated Interest	982.41	38,146.41	39,170.98
BUILDING MAINTENANCE RESERVE FUND			
Cash on Deposit			5,844.99
SOCIETY RESERVE FUND			
Cash on Deposit		27,656.14	
SECURITIES			
At Cost	88,166.50		
Add: Accumulated Interest	2,103.52	90,270.02	117,926.16
ENDOWMENT FUNDS			
F. Paul Anderson Fund			
Cash on Deposit		289.85	
Securities At Cost (Market Value $986.00)	1,000.00		
Add: Accumulated Interest	12.50	1,012.50	1,302.35
Research Fund			
Cash on Deposit			760.57
Homer Addams Fund			
Cash on Deposit			10,084.17
RESEARCH RESERVE FUND			
Cash on Deposit			52,368.87
TOTAL ASSETS			$499,571.30

LIABILITIES

GENERAL FUND				
Federal Withholding Taxes			$ 1,410.59	
Due Research General Fund			4,642.16	
Accrued Accounts				
Salaries and Commissions		$12,304.90		
Professional Fees		1,250.00	13,554.90	
Sundry Account Payable			100.00	
Deferred Income				
Prepaid Membership Dues				
Elected Members	$21,494.77			
Candidates	861.50	22,356.27		
Prepaid Admissions Fees		2,260.00	24,616.27	
RESERVE FOR FLUCTUATION IN CANADIAN EXCHANGE			9.40	$44,333.32
RESEARCH FUND				
Sundry Accounts Payable			138.17	
Deferred Income				
Unexpended Earmarked Contributions		19,318.98		
Prepaid Dues		13,590.13	32,909.11	33,047.28

NET WORTH

Society General Fund	23,959.86	
Research General Fund	48,547.11	
Property Fund	122,225.64	
Building Fund	39,170.98	
Building Maintenance Reserve Fund	5,844.99	
Society Reserve Fund	117,926.16	
F. Paul Anderson Award Fund	1,302.35	
Research Endowment Fund	760.57	
Research Reserve Fund	52,368.87	
Homer Addams Fund	10,084.17	422,190.70
TOTAL LIABILITIES AND NET WORTH		$499,571.30

COMPARATIVE STATEMENT OF INCOME AND EXPENSES

	FISCAL YEAR ENDED OCTOBER 31 1955	FISCAL YEAR ENDED OCTOBER 31 1954	INCREASE (DECREASE)
INCOME			
Income from Dues	$140,413.30	$133,756.91	$ 6,656.39
Admission Fees	8,712.65	8,429.50	283.15
Emblems, Pins, Etc.	1,558.75	819.75	739.00
Publications			
Journal Contracts	23,500.00	23,500.00	-o-
THE GUIDE	163,552.46	144,845.24	18,707.22
TRANSACTIONS	1,358.08	1,473.83	(115.75)
Books, Reprints, Codes, Etc.	4,431.74	2,026.57	2,405.17
Membership Roll	7,685.50	-o-	7,685.50
Income from Investments	908.55	1,282.89	(374.34)
Research			
Dues	73,967.74	69,784.26	4,183.48
U.S. Navy Research	1,599.68	13,340.89	(11,741.21)
Contributions - General	24,319.71	19,393.32	4,926.39
Contributions - Earmarked	82,934.45	41,079.96	41,854.49
Interest	502.78	43.87	458.91
TOTAL INCOME	*$535,445.39	$459,776.99	$75,668.40

	FISCAL YEAR ENDED OCTOBER 31 1955	FISCAL YEAR ENDED OCTOBER 31 1954	INCREASE (DECREASE)
EXPENSES			
Committees and Chapters	$ 29,869.95	$ 24,818.44	$ 5,051.51
Meetings	6,884.10	5,881.86	1,002.24
Publications			
Member Subscriptions to H.P.A.C.	20,042.06	18,139.37	1,902.69
TRANSACTIONS			
Volume 59	5,968.73	-o-	5,968.73
Volume 60	20,035.30	17,699.65	2,335.65
Membership Roll	5,796.67	2,236.22	3,560.45
Books, Reprints, Codes, Etc.	2,604.57	2,557.58	46.99
THE GUIDE	98,031.01	87,217.15	10,813.86
Headquarters	170,013.83	143,375.21	26,638.62
Fund Raising	16,936.79	10,780.01	6,156.78
Research			
Committee Expenses	5,168.06	4,915.63	252.43
Staff Salaries	100,175.04	76,849.90	23,325.14
Laboratory Expenses	23,791.87	20,951.41	2,840.46
Building Operation and Maintenance	9,804.23	9,463.39	340.84
Provision for Building Maintenance Reserve	2,000.00	2,000.00	0
U. S. Navy Research	676.51	9,851.30	(9,174.79)
Cooperative Research	44,821.70	33,165.59	11,656.11
Other Deductions	212.85	5,261.43	(5,048.58)
TOTAL EXPENSES	562,833.27	475,164.14	87,669.13
EXCESS OF EXPENSES OVER INCOME	*$ 27,387.88	$ 15,387.15	$12,000.73

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* Exposition contributions of $63,449.83 for 1955 not included in this comparative statement.

Journal Section

(Continued from p. 171)

tary, New York, N.Y. Mr. Hutchinson presented the Report of Council:

Report of Council

During the calendar year, 1955 4 regular meetings of the Council were held, the organization meeting being convened on January 27, 1955. The President announced the personnel of the Council, General and Special Committees authorized by the By-Laws.

The Society has now completed one year of operations under its new name.

Council authorized membership in the *Engineers' Joint Council* effective in 1956.

The new Journal subscription plan became effective January 1, 1956; a new editorial contract was authorized and signed.

New By-Laws on membership grades to conform to *ECPD* recommendations were submitted to the membership in December 1955, also, proposed changes in chapter operations and Nominating Committee procedure.

As required by Section 46 of the Membership Corporations' Law of the State of New York the following report is presented by the Council and filed herewith:

Assets — October 31, 1955

The Society has the following Assets:

Land and Laboratory Buildings at Cleveland, Ohio	$ 81,012.89
Furniture and Equipment, Tools, etc., at New York and Cleveland	41,212.75
On deposit in New York and Cleveland banks	202,804.18
Securities (United States and Utility Bonds) with Bankers Trust Co., New York as custodian	133,238.79
Accounts Receivable	18,366.27
Inventory Items	10,781.70
Deferred Items	6,746.49
Miscellaneous	766.07
TOTAL ASSETS — 1955	$494,929.14
TOTAL ASSETS — 1954	422,639.70
Increase for the year	$ 72,289.44

Liabilities — October 31, 1955

The Society has the following Liabilities:

Accounts Payable	$ 238.17
Federal Withholding Taxes	1,410.59
Accrued Accounts	13,554.90
Deferred Income	
Research Projects	19,318.98
Prepaid Dues, Initiation Fees, etc.	38,206.40
Reserve for	
Fluctuation in Canadian Exchange	9.40
TOTAL LIABILITIES	$ 72,738.44
Net Worth (Funds)	422,190.70
Total Liabilities and Net Worth	$494,929.14

At the end of the fiscal year, October 31, 1955, the Balance Sheet shows the Society's Net Worth as $422,190.70 compared to $370,679.89 on October 31, 1954, a net gain of $51,510.81.

Total cash in New York and Cleveland banks $202,804.18 consisting of $34,195.98 in General Operating Fund, $27,656.14 in Reserve Fund, $289.85 in F. Paul Anderson Fund, $70,579.04 in the Research General Fund, $52,368.87 in Research Reserve, $760.57 in Research Endowment, $5,844.99 in Building Maintenance Reserve Fund, $1,024.57 in the Building Fund, and $10,084.17 in the Homer Addams Fund.

Now in the Custodian Account of the Bankers Trust Co., New York, there are securities of the United States and Canadian Governments and a utility which cost as follows: General Fund $5,782.36; Building Fund $37,164.00; Reserve Fund $88,166.50 and F. Paul Anderson Fund $1,000.00.

The Society's Reserve Fund was increased by the addition of $8,712.65 Admission Fees and $1,564.37 Interest earned on Savings Bank Accounts and Securities. This is an increase of $10,277.02 bringing the Reserve Fund to $117,926.16.

The Research Reserve Fund was increased by the addition of $816.39 Interest Earned on Savings Accounts and $63,449.83 Exposition Funds allocated to Reserve Fund. During the year $25,000.00 of this fund was transferred to Research General Fund. As of October 31, 1955 the Research Reserve Fund had a balance of $52,368.87.

The Sources of Society Income were:

Admission Fees and Dues	$150,684.70
Publications	200,527.78
Interest	908.55
From Research	183,324.36
Exposition Contributions	63,449.83
TOTAL	$598,895.22

Society Expenditures were:

Meetings, Committees and Chapters	$ 36,754.05
Publications	152,478.34
Headquarters	170,226.68
Research	203,374.20
TOTAL	$562,833.27

The insurance coverage of the Society is as follows: Fire for Buildings $201,000.00; for Contents $144,500.00; Sprinkler $12,000.00; Automobile Comprehensive Public Liability $100,000-300,000.00; Property Damage $25,000.00; Medical Payments $1,000.00; Bodily Injury $25,000-100,000.00; Fidelity Bonds on Officers and all Employees $20,000.00. Workmen's Compensation is carried in New York and Ohio as required by law.

The Society has contributed to the Employees Retirement Plan Trust $3,360.99 and the participating employees contributed a substantially similar amount deducted from salary.

Membership

The Society admitted the following members in the grades indicated since January 1, 1955:

Life Members	24
Members	328
Affiliates	427
Associates	16
Junior Members	292
Students	127
TOTAL	1,214

The names and addresses of the candidates for membership were published in the JOURNAL of the Society each month during the year and are on record in the Secretary's office. The present membership total in 10,562.

Respectfully submitted,
JOHN E. HAINES, *President*
E. R. QUEER, *Treasurer*

President Haines next introduced B. H. Jennings, chairman, Committee on Research. Professor Jennings presented the printed Report of the Committee on Research for 1955 (see ASHAE JOURNAL SECTION, February 1956, p. 154). Professor Jennings expressed his pleasure at the Report being completed in time so that it could be presented to the members at the time of the Meeting. He called attention to many of the highlights of the Report emphasizing the sources of funds which are used to carry on the research activity. He called special attention to the steady increase in the amount of funds made available for work in cooperating institutions.

Since W. L. Rogers, Evanston, Ill., was not present to present his paper, Noise Production and Damping in

At the TAC on Physiological Research meeting at Cincinnati. (l. to r.) Theodore Hatch, P. R. Achenbach, R. W. Keeton, M.D., W. L. Fleisher, M. K. Fahnestock (rear) chairman, P. J. Marschall, Nathaniel Glickman, and Miss Ilse M. Jahn

Water Piping (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, January 1956, p. 181). President Haines announced that this paper would be presented by Professor Jennings.

Following presentation of the paper, discussions were offered from the floor by F. H. Faust, Bloomfield, N.J.; L. N. Hunter, Johnstown, Pa.; F. J. Linsenmeyer, Detroit, Mich.; Herbert Kreisman, Chicago Ill.; and G. A. Linskie, Dallas, Tex.

Following completion of the floor discussions, President Haines adjourned the session at 11:45 a.m.

Second Session, Monday, January 23, 2:00 p.m.

First Vice Pres. John W. James, Chicago, Ill., opened the second session in the Ballroom of the Sheraton-Gibson Hotel. After reading the rules for technical sessions, he introduced E. L. Sartain, Racine, Wis., who presented the paper, Performance of Covered Hot Water Floor Panels, by E. L. Sartain and W. S. Harris (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, October 1955, p. 117).

Written discussions of this paper had been prepared by L. F. Schutrum, Cleveland, Ohio, and W. F. Spiegel, Philadelphia, Pa. After their presentation, Prof. Harry Buchberg, Los Angeles, Calif., discussed the paper from the floor. In closing the discussion, Mr. Sartain expressed his pleasure that the results of his paper appeared to agree with Laboratory work done at Cleveland. He also indicated that he doubted if the answer to the problem of balancing with various types of floor coverings would be to provide different types of insulation under the slab.

Chairman James then explained that the second paper, Thermal Design of Warm Water Ceiling Panels (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, December 1955, p. 123), was the result of work done under the direction of the Technical Advisory Committee on Panel Heating & Cooling. The paper itself was presented by L. F. Schutrum from the Laboratory staff.

A written discussion had been prepared by S. C. Huddleston, New Kensington, Pa., and a lively discussion from the floor followed, participated in by R. L. Maher, Waterbury, Conn.; P. B. Gordon, New York, N.Y.; D. L. Lindsay, Montreal, Canada; E. L. Sartain, Racine, Wis.; E. R. Kaiser, Cleveland, Ohio; Harry Buchberg, Los Angeles, Calif.; and F. J. Linsenmeyer, Detroit, Mich.

At Cincinnati ASHAE Life Members met for the first time as a group at an Annual Meeting: (Seated) W. G. Boales, Detroit; A. C. Buensod, New York; E. K. Campbell, Kansas City; E. P. Heckel, Chicago; A. E. Stacey, Jr., Syracuse; W. L. Fleisher, New York; G. H. Cummins, Detroit; W. E. Heibel, New York; R. P. Schoenijahn, Wilmington, Del. (Standing) H. S. Wheller, Linden, N. J.; C. R. McConner, Kalamazoo; Roswell Farnham, Buffalo; H. E. Sproull, Cincinnati; W. E. Gray, Frederick, Md.; J. J. Yager, Buffalo; M. S. Smith, New York. (H. H. Wright, Kansas City, attended the Meeting but is not shown in photo)

Chairman James then introduced D. J. Vild, Cleveland, Ohio, who abstracted the paper, Heat Gain Through Glass Skylight Fenestrations, by D. J. Vild and G. V. Parmelee (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, January 1956, p. 201).

No written discussions had been received, but R. W. McKinley, Pittsburgh, Pa.; E. R. Kaiser, Cleveland, Ohio; E. W. Conover, Detroit, Mich.; and R. A. Miller, Pittsburgh, Pa.; all discussed the paper from the floor.

As there was no further business to come before the session, Chairman James adjourned the session at 4:05 p.m.

Third Session, Monday, January 23, 2:30 p.m.

Treas. E. R. Queer, University Park, Pa., opened the third session in the Roof Garden of the Sheraton-Gibson Hotel. After reading the rules for technical sessions, Professor Queer introduced K. R. Solvason, Ottawa, Ont., Canada, who presented the paper, Moisture in Transient Heat Flow (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, November 1955, pp. 137-148). After this paper was discussed from the floor by B. L. Palmer, Jackson, Miss., Mr. Solvason closed the discussion.

Chairman Queer next introduced Dr. S. M. Yen, Manhattan, Kans., who presented the paper, Characteristics of Downward Jets from a Vertical Discharge Unit Heater, by S. M. Yen, Linn Helander and L. B. Knee (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, November 1955, pp. 149-155).

Written discussions on this paper had been prepared by R. M. Conner, Cleveland, Ohio; H. H. Yousoufian, New York, N.Y.; Alfred Koestel, Cleveland, Ohio; and H. B. Nottage, Santa Monica, Calif.

Additional discussions were presented from the floor by L. R.

Phillips, Hartford, Conn.; E. K. Campbell, Kansas City, Mo.; Herbert Ziel, Detroit, Mich.; and I. A. Naman, Houston, Tex.

Following these discussions, Dr. Yen then presented his remarks closing the discussion period.

Chairman Queer announced that the next paper would be Resistance of Rectangular Divided Flow Fittings, by L. G. Miller, C. H. Pesterfield and R. J. Waalkes (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, January 1956, p. 195), and introduced Mr. Waalkes, Holland, Mich., who then presented the paper. W. O. Huebner, New York, N.Y., and W. M. Lowe, Cleveland, Ohio, discussed the paper from the floor and Mr. Waalkes completed the discussion period with his closing remarks.

Chairman Queer then adjourned the session at 4:30 p.m.

Fourth Session, Tuesday, January 24, 9:30 a.m.

The fourth session was held in the Ballroom of the Sheraton-Gibson Hotel and was opened by Pres. John E. Haines who called on G. V. Sutfin, Cincinnati, Ohio, to present the Report of the Inspectors of Election. The Report showed the following results:

Report of Inspectors of Election

BALLOT FOR OFFICERS:	TOTAL
President	
John W. James, Chicago, Ill.	1916
First Vice President	
P. B. Gordon, New York, N. Y.	1914
Second Vice President	
E. R. Queer, University Park, Pa.	1910
Treasurer	
R. A. Sherman, Columbus, Ohio	1902
MEMBERS OF COUNCIL *(three-year term)*	
A. B. Algren, Minneapolis, Minn.	1834
John Everetts, Jr., Philadelphia, Pa.	1810
J. N. Livermore, Detroit, Mich.	1817
John H. Ross, Toronto, Canada	1817
COMMITTEE ON RESEARCH *(three year term)*	
F. H. Faust, Bloomfield, N. J.	1814
Ford K. Hick, Chicago, Ill.	1814
R. C. Jordan, Minneapolis, Minn.	1809
H. A. Lockhart, Morton Grove, Ill.	1801
Arthur Nutting, Louisville, Ky.	1796
TOTAL BALLOTS RECEIVED	1923
TOTAL LEGAL BALLOTS	1916
INVALID BALLOTS	7

Scattering votes: Members of Council 8 and Committee on Research 1.

Respectfully submitted,
G. V. Sutfin, Chairman,
Cincinnati, Ohio
John A. Guy
Columbus, Ohio
Herman Worsham,
Dayton, Ohio

President Haines then turned the meeting over to John Everetts, Jr., Philadelphia, Pa., as vice chairman. Chairman Everetts read the rules for technical sessions and then called on Dr. H. C. Hardy, Chicago, Ill., to present the paper, Evaluation of Equipment Noise, by H. C. Hardy and D. E. Bishop (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, September 1955, p. 137).

A written discussion prepared jointly by C. H. Allen and L. L. Beranek, Cambridge, Mass., was presented, as was also one written by

(Left) E. K. Campbell, Kansas City, Mo., Life Member and former Treasurer of Society

(Below) E. R. Queer addressing the members and guests at the third session with S. M. Yen co-author of one of the papers presented at this session

AMERICAN SOCIETY
of
HEATING & AIR-CONDITIONING
ENGINEERS

The Reverend Laurence Hall holds close attention of his audience as he delivers his address "Humor — America's Secret Weapon" at 62nd Annual Banquet. (Seated) Mrs. L. N. Hunter, President-Elect James, Mrs. John E. Haines, C. P. Krantz, chairman Entertainment Committee for Annual Meeting, Retiring President Haines, Mrs. John W. James, Dr. R. W. Keeton, Mrs. E. R. Queer

R. V. Waterhouse, Washington, D.C. and another by C. M. Ashley, Syracuse, N.Y. H. A. Lockhart, Morton Grove, Ill., outlined the recent activity of the TAC on Sound and vibration Control. Following this, Dr. Hardy closed the discussion.

The next paper on the program was entitled Electric Analogue Studies of Single Walls, by Harry Buchberg (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, October 1955, p. 125). Professor Buchberg was present to give his paper.

Written discussions of this paper had been received from N. R. Gay, Ithaca, N.Y.; L. W. Nelson, Hopkins, Minn.; H. B. Nottage, Santa Monica, Calif.; and S. F. Gilman, Syracuse, N.Y. In view of the extended written discussions, Professor Buchberg in his closure not only commented on the points raised by the discussers but gave additional information on some of the more recent work which has been done on this project at the University of California.

Chairman Everetts next called on Prof. C. F. Kayan, New York, N.Y., to present his paper Electrical Analogger Analysis of Cooled-Structure Complex (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, November 1955, p. 143).

Written discussions had been received from H. T. Gilkey, Cleveland, Ohio; S. F. Gilman, Syracuse, N.Y.; L. W. Nelson, Hopkins, Minn.; and H. B. Nottage, Santa Monica, Calif.

Following the closure by Professor Kayan, Chairman Everetts turned the meeting back to President Haines who recessed the session at 12:00 noon.

Fifth Session, Tuesday, January 24, 10:00 a.m.

First Vice Pres. John W. James opened the meeting in the Roof Garden of the Sheraton-Gibson Hotel and at once introduced Prof. M. K. Fahnestock, Urbana, Ill., as vice chairman.

Vice Chairman Fahnestock first read the rules for technical sessions and then stated that Dr. H. S. Belding, Pittsburgh, Pa., would present the paper, Index for Evaluating Heat Stress in Terms of Resulting Physiological Strains, by H. S. Belding and T. F. Hatch (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, August 1955, p. 129).

Written discussions had been prepared by L. A. Brouha, M.D., Wilmington, Del.; K. L. Dunn, Corning, N.Y.; C. P. Yaglou, Boston, Mass.; C. L. Taylor, Los Angeles, Calif.; and J. H. Clarke, Chicago, Ill.

The following people also took part in the discussion by making comments from the floor: W. C. L. Hemeon, Pittsburgh, Pa.; W. L. Fleisher, New York, N.Y.; F. K. Hick, M.D., Chicago, Ill.; and R. S. Ash, Phoenix, Ariz.

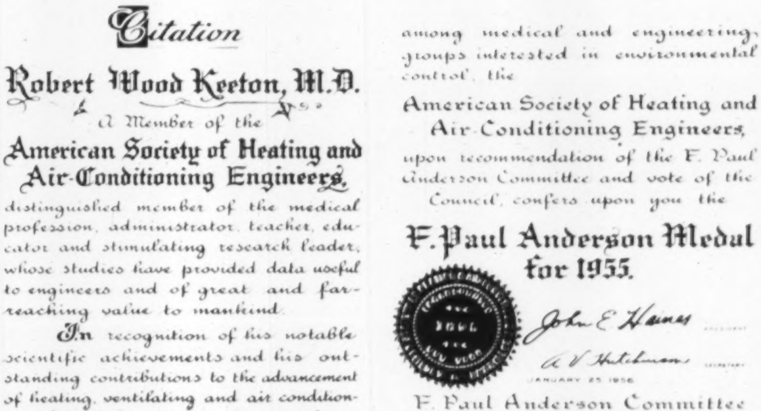
On the completion of the discussions, both Drs. Hatch and Belding made closing comments covering the points raised by the several discussers.

The second paper on the program, Body Evaporation During Short Exposures to Various Temperatures, Humidities, Pressures and Mass Velocities, by J. W. McCutchan (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, September 1955, p. 151) was presented by Mr. McCutchan.

Written discussions had been prepared by David Minard, M.D., Washington, D. C.; T. F. Hatch, Pittsburgh, Pa.; and L. P. Herrington,

AMERICAN SOCIETY
of
HEATING & AIR CONDITIONING
E   S

R. W. Keeton, M.D., Chicago, Ill., receives 13th F. Paul Anderson Medal



Citation

Robert Wood Keeton, M.D.

A Member of the

American Society of Heating and Air-Conditioning Engineers,

distinguished member of the medical profession, administrator, teacher, educator and stimulating research leader, whose studies have provided data useful to engineers and of great and far-reaching value to mankind.

In recognition of his notable scientific achievements and his outstanding contributions to the advancement of heating, ventilating and air conditioning through his studies of atmospheric environment and its effects upon the comfort and health of people, and his interest in maintaining scientific liaison among medical and engineering groups interested in environmental control, the

American Society of Heating and Air-Conditioning Engineers,

upon recommendation of the F. Paul Anderson Committee and vote of the Council, confers upon you the

F. Paul Anderson Medal for 1955.

1894

John E. Haines

A V Hutchinson

JANUARY 25 1956

F. Paul Anderson Committee

John W. James

E. T. Avery
E. P. Heckel
P. D. Gayman
R. F. Taylor

Journal Section

New Haven, Conn. Following the completion of these discussions, Mr. McCutchan made his closing remarks.

R. L. Kuehner, York, Pa., was present in person to give his paper, Humidity Effects on the Odor Problem (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, September 1955, p. 155). Discussions from the floor were presented by: W. L. Fleisher, New York, N. Y.; C. S. Leopold, Philadelphia, Pa.; and T. H. Urdahl, Washington, D.C. Following completion, Vice Chairman Fahnestock turned the meeting back to First Vice President James. Vice President James then adjourned the session.

John E. Haines conducting the concluding business items at the seventh session. (Seated) First Vice Pres. P. B. Gordon, A. W. Edwards, general chairman Cincinnati Committee on Arrangements, John Everetts, Jr., newly elected member of Council, and Past President Hunter. B. W. Farnes, member of Council (standing).

Sixth Session, Wednesday, January 25, 9:30 a.m.

Meeting in the Ballroom of the Sheraton-Gibson Hotel, Second Vice Pres. P. B. Gordon called the sixth session to order and stated that G. V. Sutfin, Cincinnati, Ohio, would report for the Inspectors on the vote for By-Law Amendments.

Mr. Sutfin then gave an item-by-item report of the *yes* and *no* votes on the 28 items on which Members had voted by letter ballot. A statement covering these Amendments appears on pp. 133-135 of the December 1955 issue of the JOURNAL. Mr. Sutfin's report indicated that all the proposed 28 Amendments had been passed by votes of approximately 1800 in favor to 10 to 20 votes against.

Chairman Gordon then outlined the nature of the session pointing out that all of the technical papers to be presented dealt with various phases of the design and application of high velocity air distribution systems. He indicated also that the symposium scheduled for the seventh session would be devoted to this same subject. Following this outline of the nature of the meeting, Chairman Gordon introduced R. W. Waterfill, New York, N.Y., who presented the paper Elements of Dual-Duct Design and Performance, by N. S. Shataloff (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, September 1955, p. 143).

Written discussions of the paper had been prepared by R. P. Cook, Rochester, N.Y. and A. A. Giannini, New York, N.Y. Discussions from the floor were presented by W. A. Grant, Syracuse, N.Y.; I. A. Naman, Houston, Tex.; and H. E. Ziel, Detroit, Mich. Following completion of the discussions, Mr. Waterfill then made the closing remarks covering the comments made by the discussers.

Chairman Gordon then presented S. F. Gilman who gave an abstract of the paper Branch Fitting Performance at High Velocity, by C. M. Ashley, S. F. Gilman and R. A. Church (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, December 1955, p. 117).

This paper was discussed from the floor by W. G. Colborne, Kingston, Canada; P. A. Argentieri, Danbury, Conn.; and W. O. Huebner, New York, N. Y.; after which Dr. Gilman ended the discussion by commenting on the several points raised by the discussers.

Chairman Gordon then called on E. F. Snyder, Jr., Minneapolis, Minn., to present his paper Self-Actuated Room Control from High Speed Air (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, January 1956, p. 189).

This paper was discussed by C. M. Ashley, Syracuse, N.Y. and H. H. Yousoufian, New York, N.Y. and Mr. Snyder closed the discussion.

Chairman Gordon then adjourned the session at 11:35 a.m.

Seventh Session, Wednesday, January 25, 2:00 p.m.

The seventh session was arranged in the form of a symposium on the general subject of High Velocity Air Distribution.

Second Vice Pres. P. B. Gordon, New York, N.Y., opened the session in the Ballroom of the Sheraton-Gibson Hotel. Five papers had been arranged covering various topics as follows: *Duct Design* — C. M. Wilson, New York, N.Y.; *Economics, Costs vs. Velocity* — John Everetts, Jr., Philadelphia, Pa. *Fan and Air Noises* — R. D. Lemmerman, Hartford, Conn.; *Duct Construction* — K. A. J. Monier, San Antonio, Tex.; *Field Testing* — R. D. Tutt, New Britain, Conn.

However, Mr. Lemmerman was not able to be present, and his place was taken by D. B. Callaway, Beverly Hills, Calif. Similarly Mr. Tutt found it impossible to be present and was represented by W. L. Batchelor, New Britain, Conn.

Chairman Gordon called on these authors sucessively and they presented their prepared material after which the chairman indicated that questions from the floor could be directed to these various authors.

These papers and the discussions, being of an informal nature, are not expected to be printed in the JOURNAL and TRANSACTIONS following the style usually used for formal technical papers. It is anticipated, however, that the material in some form will be made available. Announcement concerning availability is planned for the near future.

Following the completion of the presentation of the Symposium material, Second Vice Pres. P. B. Gordon turned the meeting back to President Haines.

At this point, President Haines received from F. J. Kurth, New York, N.Y., a plaque presented to ASHAE by a group of German engineers. This group had visited various plants in the United States during 1955 and some of the members of the group had been present at the 61st Annual Meeting in Philadelphia. Mr. Kurth read the German inscription on the plaque and also provided an English translation. President Haines accepted the plaque in the name of the Society, expressing appreciation for this thoughtful action.

President Haines called on L. N. Hunter, Johnstown, Pa., who presented the resolutions passed by the Special Resolutions Committee concerning the loss of Frank P. Keeney, Chicago, Ill.

President Haines then called on John Everetts, Jr. who presented the Report of the Resolutions Committee.

Following the acceptance of this Report, President Haines recessed the session until the Banquet at 7:00 p.m., announcing that the newly elected officers would be installed at that time, and that at the completion of the Banquet, the 62nd Annual Meeting would be adjourned.

Resolutions

WHEREAS, the 62nd Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS is now drawing to its close, and

WHEREAS, this meeting was held in Cincinnati and its Kentucky suburbs and has brought to those who *neffer vere in Zinzinnati* the opportunity to realize their lifelong desires and to those who *before vere in Zinzinnati* an ever repeated delight, and

WHEREAS, the technical life of the Society has been advanced through the presentation and discussion of a series of well prepared papers and symposia, and

WHEREAS, through the excellent facilities provided, the technical and other committees of the Society have been able to conduct their meetings and accomplish their aims efficiently and comfortably, and

WHEREAS, the *Zinzinnati* Chapter, through its Committee on Arrangements, who placed feathers in their hats before the meeting started, have gone far beyond the call of duty in provision of opportunity for good fellowship, high quality of entertainment, and restful relaxation; therefore

BE IT RESOLVED that the sincere thanks and appreciation of all present be extended

TO A. W. Edwards, general chairman, H. E. Russell, vice chairman, H. E. Sproull, honorary chairman, and through them to the entire Committee on Arrangements and to the officers and members of the Cincinnati Chapter,

TO the ladies of the Chapter for their gracious hospitality at the reception and tea and their untiring efforts in entertaining and assisting the visiting ladies,

TO F. W. Giesel of the *Cincinnati Post* for his outstandingly inspirational and thought provoking address at the Welcome Luncheon,

TO the Cincinnati Gas and Electric Co., the Strietmann Biscuit Co., and the Terrace Plaza Hotel for their hospitality on the trips of inspection,

TO the Reverend Laurence Hall, whose talk at the Annual Banquet we look forward to with great anticipation,

TO the hotel managements who have been thoughtful of our needs and comfort,

TO the authors and discussers of technical papers for the educational contributions,

TO President John E. Haines, whose untiring work through the past year has culminated in such a successful Annual Meeting,

TO all members of the Headquarters Staff both present at Cincinnati and those remaining in New York, without whose continuous efforts the progress of the Society would cease, and

TO the chairman of the Committee on Resolutions without whose help these resolutions were prepared, and who has not seen them until this reading.

Respectfully submitted,

RESOLUTIONS COMMITTEE

John Everetts, Jr., *Chairman*
Philadelphia, Pa.
R. A. Sherman, Columbus, Ohio
W. J. Collins, Jr., Oklahoma City, Okla.

Eighth Session, Wednesday, January 25, 2:30 p.m.

The eighth session took the form of a symposium type meeting on the subject of Air Pollution. This session was called to order by Pres. John E. Haines in the Roof Garden of the Sheraton-Gibson Hotel. After announcing that the session should adjourn promptly so that all present could have an opportunity to attend the business meeting of the seventh session, President Haines turned the session over to Prof. C. H. Pesterfield, E. Lansing, Mich., who acted as vice chairman and as moderator of the symposium.

Arrangements had been made for the assembly of six papers each by well-known experts in the field of air pollution. The list follows: *Health Aspects* — W. C. Cooper, M.D. and A. C. Stern, both of Cincinnati, Ohio; *Smog* — G. P. Larson, Wayne, Pa.; *Regulations* — H. C. Ballman, Pittsburgh, Pa.; *Cleaning* — J. W. May, Louisville, Ky.; *Practical Approach* — C. W. Gruber, Cincinnati, Ohio; *Enforcement* — J. H. Carter, St. Louis, Mo.

Moderator Pesterfield called on these authors successively and each presented his prepared material. Following this, a discussion took place with questions directed to the several speakers.

Somewhat shortened versions of the papers presented by each of the speakers at the Symposium appear in this issue of the JOURNAL on pages 156 to 163. It is not expected that these papers will appear in the TRANSACTIONS since they are made available in this issue of the JOURNAL. Following completion of the discussions, the chairman recessed the session, suggesting that all Members present attend the business session.

Council and Committee Meetings

As usual, the Annual Meeting was the occasion for holding meetings of many important Society committees.

Council and sub-groups of the Committee on Research began meeting as early as Saturday and continued to meet through Sunday. Additionally, the new Council held an organization meeting on Thursday as did also the new Committee on Research.

In order to expedite its work, the 1956 Guide Committee also met as did no less than 9 of the technical advisory committees.

As is usually the case, many informal and unscheduled meetings of various groups took place throughout the whole course of the Annual Meeting.

Special Events and Ladies' Program

These began with the reception and tea held at the hotel on Sunday afternoon and continued through the address of F. W. Giesel, business manager of the *Cincinnati Post*, who held the close attention of his audience at the Welcome Luncheon on Monday. Mr. Giesel presented his unusual viewpoint concerning the subject, *Forward — A Look at Tomorrow*.

Outstanding on the special events program was the Kentucky Party which had been carefully planned for Monday evening and which included a trip by bus, for virtually all who attended the Meeting, to a country club on the Kentucky side of the river.

Members and guests at Annual Banquet. (L. to R.) Seated: J. R. McConnell, Mrs. H. J. Noles, Mrs. McConnell, C. S. Stock, Mrs. C. B. Gamble, J. R. Kayse, and Mrs. Cheyne. (Standing) H. J. Noles and C. B. Gamble

An innovation of this Annual Meeting was the first scheduled Life Members' Luncheon which was held on Tuesday, while inspection trips to Beckjord Station, to Strietmann Biscuit Company and to the Terrace Plaza Hotel occupied the afternoon.

The Past Presidents' Dinner held at each Annual Meeting has become a fixture and this year there were 6 past presidents on hand.

Past Presidents in attendance at the Past Presidents' Dinner with A. V. Hutchinson, executive secretary (front). (L. to R.) John E. Haines, Minneapolis, Minn.; M. F. Blankin, Philadelphia, Pa.; S. H. Downs, Kalamazoo, Mich.; Mr. Hutchinson; L. E. Seeley, Durham, N. H.; L. N. Hunter, Johnstown, Pa.; W. L. Fleisher, New York, N. Y.; and Capt. A. E. Stacey, Syracuse, N. Y.

The Cincinnati Chapter provided no less than 3 features of interest to the ladies attending the meeting. These included a visit to the Cinerama on Monday afternoon, a trip around the city and a hotel luncheon on Tuesday, while a style show and luncheon completed the Ladies' Program on Wednesday at noon.

Banquet, Installations, Award

The Annual Banquet held on Wednesday evening was, as usual, the climax event. Held on the Roof Garden of the Sheraton-Gibson Hotel, the banquet was presided over by C. P. Krantz, chairman, Entertainment Committee, Cincinnati Chapter, as toastmaster.

Rev. Laurence Hall Speaks

The speaker of the occasion was the Reverend Laurence Hall, an English-born American minister, who kept the large audience of about 500 convulsed throughout his address on the subject *Humor — America's Secret Weapon*.

Installation of the new officers and the presentation of the past president's emblem to John E. Haines by Past President L. N. Hunter was impressive, as was also the introduction and installation of the new officers for 1956.

Medal to Dr. Keeton

Perhaps the outstanding event at the banquet was one not appearing on the formal program. Upon receiving the 13th presentation of the F. Paul Anderson Medal, R. W. Keeton, M.D., replied by presenting a most outstanding and unusual paper in which he summarized the present state of knowledge on the subject of man's reaction to his air environment.

We are indebted to W. M. Wallace, II, Durham, N.C., for making available various photographs taken during the course of the meeting, some of which are reproduced on these pages.

Summary of Chapter Meetings*

• *ARIZONA*: By-law changes were unanimously adopted at the December meeting, presided over by Pres. W. A. Biddle.

A brief talk and the showing of a motion picture on the construction, selection and economics of various installations was presented by representatives of the Johns-Manville Corp., New York, N. Y. Particular emphasis was given to installations for chilled water, hot water and steam piping. J. B. Hoaglund, program chairman, introduced the speakers. Attendance 35. Attendance ratio 0.44.

• *ATLANTA*: *Science in Space* was the interesting topic of the December guest speaker, Vernon Crawford, professor of Physics, Georgia Institute of Technology, Atlanta. Vice Pres. F. W. Bull presided. Attendance 40. Attendance ratio 0.25.

• *BATON ROUGE*: The program for the December meeting consisted of a panel of chapter members who answered questions from the floor on *Air Conditioning, Its Allied Problems and Their Solution.* With W. I. Pol acting as moderator, D. W. Chesson and Pres. C. S. Woodruff replied to questions relating to the consulting engineer. J. L. Webb handled the architectural problems and F. D. Beaullieu, III, presented the contractor's viewpoint. The points most generally discussed were: lack of equipment room space, lack of duct space, electrical control diagrams, electrical problems in mechanical work, and refrigeration capacity for fresh air. Attendance 32. Attendance ratio 0.38.

• *CENTRAL NEW YORK*: The January speaker, Philip Foglia, area sales manager, Combustion Control Division, Electronics Corp. of America, handled his topic, *The Safe Burning of Fuel*, in a pleasing and convincing manner. He pointed out the causes of explosion in industrial burners and the past and present methods of correction. A colored motion picture was shown illustrating the development of safety devices. H. J. Morton, chairman of the program committee, introduced the speaker.

Pres. L. A. Childs mentioned some research done by the officers and board of governors regarding the enlargement of meeting notices to include news items. S. F. Gilman announced that a short course in hot air heating will be held at University College, Syracuse University, in the near future. Attendance 49. Attendance ratio 0.26.

• *CENTRAL OHIO*: *Contamination of Air in Industry* was the subject for a talk and demonstration at the January meeting. This presentation was given by H. G. Bourne, chief, division of industrial hygiene, Ohio state department of health, and his principal engineer, L. B. Fosdick. Instruments used in air contamination work were shown to the members and guests. Actual tests of measurements of concentration of dusts, fumes, gases and vapors in air samples were made. Mr. Bourne defined and described the method of testing, and as each test and description was completed, discussion with members and guests added interest.

C. R. Graf, program chairman for the meeting, also introduced G. F. Landgraf, vice president in charge of engineering, Trion, Inc., McKees Rocks, Pa. Mr. Landgraf spoke on *Electrostatic Precipitation*, starting with some interesting historical discoveries and tracing the development of methods and equipment used today in various fields. He gave an informative discussion on electrostatic filters, demonstrating with a model filter to permit a view of actual precipitation of dust and fumes.

Pres. R. A. Wilson presented a past president's pin to J. A. Guy. Attendance 43. Attendance ratio 0.29.

• *CINCINNATI*: E. C. Pandorf, Cincinnati Gas & Electric Co., spoke on *Industrial Application of Atomic Energy* at the January meeting.

Pres. A. H. Gerdsen asked A. W. Edwards, general chairman, Committee on Arrangements, to report on the progress of plans for the 1956 Annual Meeting. Mr. Edwards urged all the members to work hard to insure a successful program. Attendance 42.

• *CINCINNATI*: No old or new business was brought up at the December meeting at which two talks were featured. *Plastics for Home Construction* was the topic of a coffee talk by Oscar Smith, Monsanto Chemical Co., Plastics Division, Springfield, Mass. The main presentation was given by W. H. Williamson, General Electric Co., Evendale, Ohio, on *Solving Air Pollution Problems*. Pres. A. H. Gerdsen was the presiding officer. Attendance 55. Attendance ratio 0.38.

• *DELTA*: Technical Papers Chairman E. H. Sanford introduced the January guest speaker, P. W. Wyckoff, chief engineer, Airtemp Division, Chrysler Corp., Dayton, Ohio. Mr. Wyckoff's discourse on *Performance and Operational Costs of Waterless Air Conditioners* was well received by all the members. Pres. W. B. Martin, Jr., was the presiding officer at the meeting. Attendance 54. Attendance ratio 0.27.

EDMONTON GROUP RECEIVES CHARTER

At the organization meeting of the Northern Alberta Chapter held in Edmonton, Alberta, on February 22, Pres. John W. James presented the Charter. This makes the Northern Alberta Chapter the 62nd.

Present also at the Charter meeting were, Regional Director John H. Fox and A. V. Hutchinson, executive secretary.

• *DELTA*: At a joint *ASRE*-ASHAE meeting held in December, with *ASRE* acting as host, C. B. Gamble, Cary B. Gamble & Associates, New Orleans, La., gave an informative presentation on *Electronics in Air Conditioning*. No business was conducted. Attendance 49. Attendance ratio 0.33.

• *EMPIRE STATE CAPITAL*: Society Pres. John E. Haines, Minneapolis, Minn., guest speaker in January, delivered his optimistic talk on *The Next Ten Years*, covering the development of the Society and industry during the past ten years, as well as predicting for the future decade.

Presentation of chapter life membership cards was made by President Haines to H. A. Bond and G. A. Teeling. Chapter Pres. L. V. Appleby presided at the meeting. Pocket card remarks by those attending indicated 100 percent concurrence that it was an excellent meeting which was thoroughly enjoyed. Attendance 41. Attendance ratio 0.60.

• *EMPIRE STATE CAPITAL*: An appreciative audience at the December meeting heard George Walker, Johns-Manville Corp., New York, N. Y., give a presentation on *Innovations in Insulation*. Mr. Walker, introduced by B. E. Mullen, who acted as chairman, pointed out the importance of proper insulation and new field practices. Pres. L. V. Appleby presided at the meeting. Attendance 66. Attendance ratio 0.41.

• *ILLINOIS*: Pres. G. G. Freyder turned the January meeting over to Prof. M. K. Fahnestock, who introduced the speakers of the evening. W. S. Harris, research professor, mechanical engineering, University of Illinois, Urbana, discussed the University's activities in regard to residential heating and cooling with water. He cited two basic approaches utilized in the investigation of this problem: combination heating and cooling coils and fans for the complete heating and cooling, and a separate system wherein the heat loss is taken care of by means of baseboard radiation and the cooling requirements by fan coil units suspended from the ceiling at a central location. Professor Harris indicated that a much more uniform temperature was obtainable utilizing the split system. He felt that if any compromise was to be made in the system's operation, it should be in the

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*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

Journal Section

cooling, inasmuch as the heating, in his opinion, was the more important of the two factors.

D. R. Bahnfleth, who is also connected with the University of Illinois, as research assistant in mechanical engineering, spoke on the use of air for residential heating and cooling. In his opinion, the perimeter type of air distribution is much superior to the previous custom of introducing air at ceiling level and recirculating at the floor near the exposures. Attendance 205.

• *ILLINOIS*: Pres. G. G. Freyder called upon John W. James, Society first vice president, Chicago, at the December meeting, to describe the proposed Regional Plan. Vice Pres. H. G. Gragg outlined plans for securing unified transportation to the 1956 Annual Meeting.

F. A. Balzer, meeting chairman, introduced the speakers. Norman Mason, chief engineer, Vibration Mountings, Inc., spoke on *Vibration Controls in Heating, Ventilating and Air Conditioning Systems*. Mr. Mason emphasized the increasing need for better methods of isolating vibration. A second speaker, J. H. Hughes, Industrial Sound Control, Inc., discussed noise control in ventilating systems, and described the most common methods of eliminating duct noise. Attendance 113.

• *IOWA*: Speaking at the December meeting, W. M. Scott, president, Wray M. Scott Co., Inc., Omaha, Neb., expressed the belief that all heating, piping, ventilating, air conditioning, and temperature control work should be grouped into one prime mechanical contract in order to achieve satisfactory accomplishment of mechanical work in a modern building. Mr. Scott, who was introduced by Program Chairman D. E. Schroeder, also said that architects cannot adequately police contracts at present fees and must depend on selection of responsible contractors.

R. T. Howard, Jr., a chapter member, commented on *New Test Data Simplifies Fluid Flow Problems*, an article by E. P. DeCraene, *Heating, Piping & Air Conditioning*, October 1955. Presentation of a past president's pin was made to W. E. Nanes. Attendance 58. Attendance ratio 0.49.

• *IOWA*: *How to Win an Architect* was the subject of a talk by P. S. Skiles, architect with Wetherell and Harrison, at the November meeting. Mr. Skiles asked the engineer to have respect for the architect's opinion and problems, and at the same time to fight for desirable features in the mechanical design. D. E. Schroeder, program chairman, introduced the speaker.

R. R. Schilling, Iowa Chapter member, gave a review of a paper in the ASHAE Journal Section, *Heating, Piping & Air Conditioning*, March 1955—Performance and Evaluation of Room Air Distribution Systems, by Alfred Koestel and G. L. Tuve. Attendance 41. Attendance ratio 0.39.

• *KANSAS CITY*: In an easy conversational manner, E. R. Kaiser, director of research, ASHAE Research Laboratory, Cleveland, Ohio, at the December meeting described each of the 23 research projects now being carried on by, or under the supervision of, the Society. R. M. Spencer introduced the speaker, who was attentively received by those present. Pres. A. S. Hurt, Jr., extended the thanks of the chapter to Mr. Kaiser.

Secy. S. C. McCann read a communication from the University of Kansas announcing the formation of two new extension courses covering creative thinking and paper work management. Attendance 66. Attendance ratio 0.23.

• *MICHIGAN*: Pres. D. S. Falk introduced the guests at the speaker's table at the December meeting, and 15 *ASRE* members were in attendance. J. M. Baragar of the *ASRE* presented J. G. Yergat, General Electric Co., Bloomfield, N. J., who spoke on *The Heat Pump*. Attendance 120. Attendance ratio 0.19.

• *NEBRASKA*: The Honorable R. L. Hurska, U.S. Senator from Nebraska, spoke at the December meeting on *Atomic Energy for Nebraska*. Pres. T. E. Davis introduced Senator Hurska. Attendance 89.

• *NEW MEXICO*: Pres. H. F. Munn introduced Hugh Paxton, November meeting speaker, who described critical assemblies in a design of atomic reactors, using language that all could understand. Mr. Paxton also showed slides of assemblies at the critical stage and curves that demonstrated exactly what was happening. Attendance 36. Attendance ratio 0.68.

• *NORTH JERSEY*: An interesting discourse on *Some Urgent Needs of Water in New Jersey* was given at the December meeting by T. C. Nelson, professor of zoology, Rutgers University, New Brunswick, N. J. Professor Nelson illustrated his talk with colorful slides. Pres. C. H. Smith was the presiding officer. Attendance 57.

• *NORTH TEXAS*: At a dinner-dance held in lieu of the December meeting, Pres. J. A. Ray announced the report of the Tellers Committee, consisting of W. R. Hopkins, D. P. Maley, Jr., and A. A. Wright, Jr. Newly elected officers are as follows: *President* — H. G. Gregerson; *Vice President* — G. H. Meffert; *Secretary* — Ross Zumwalt; *Treasurer* — J. D. Poythress; *Board of Governors* — E. J. Hatzenbuehler, O. H. Mehl and J. A. Ray. Attendance 310.

• *NORTHEASTERN OKLAHOMA*: Election results were announced at the December meeting by R. F. Shoemaker, chairman of the nominating committee. The new slate selected is: *President* — H. W. Meinholtz; *Vice President* — J. C. Netherton; *Secretary* — H. L. Cauvel; *Treasurer* — T. E. Krieg; *Board of Governors* — J. N. Watt, J. D. Ryan, R. W. Winget and C. H. Dollmeyer.

A film entitled *Steel Is More Precious Than Gold* was shown. J. C. Netherton was in charge of the program, and W. C. Roads had made the arrangements. Pres. J. T. McKinney presided. Attendance 19. Attendance ratio 0.36.

• *NORTHERN OHIO*: John E. Haines, Society president, Minneapolis, Minn., who was guest speaker at the January meeting, covered the growth of the Society and the air-conditioning industry during the past ten years. President Haines, in his talk entitled *The Next Ten Years*, predicted that Society membership will increase from 10,000 to 20,000 members by 1965. He also forecast that the present air-conditioning industry will more than double its value during the next decade. Pres. L. C. Burkes was the presiding officer. Attendance 78.

• *NORTHERN OHIO*: William Rodgers, director of the Port of Cleveland, spoke at the December meeting, presided over by Pres. L. C. Burkes, on the effect of the St. Lawrence Seaway on Cleveland's commerce and industry. Attendance 63.

• *NORTHERN PIEDMONT*: The Carolina Section, *ASRE*, acted as host at a joint *ASRE*-ASHAE meeting held in December. The meeting was called to order by *ASRE* Pres. W. D. Graham, Jr., who introduced ASHAE Pres. S. T. Oliver.

H. V. Caton of *ASRE* presented the speaker of the evening, R. D. Lemmerman, vice president, Industrial Sound Control, Inc., Hartford, Conn. Mr. Lemmerman spoke on the *Cause, Analysis and Solution of Noise* as it pertains to heating and air conditioning systems. Attendance 48. Attendance ratio 0.28.

• *OKLAHOMA*: Since the scheduled speaker was forced to cancel his talk, a film entitled *Genie of the Flame* was shown at the December meeting. A past president's pin was presented to G. E. Ervin by Pres. J. R. Patten. Attendance 55. Attendance ratio 0.39.

• *ONTARIO*: The subject of a panel meeting held in December, *Bid Depository*, was explained by R. Davidson, secretary-manager, *Association of Master Plumbers & Heating Contractors*. A panel, consisting of W. A. Mould, Samuel Crump, D. P. Giffin and K. B. Martin, answered questions from the members on the topic. M. C. Bailey acted as mediator.

W. L. Rootham, chairman, special events committee, arranged the surprise attendance of the members' wives at the Christmas party following the meeting. Attendance 150.

• *OTTAWA VALLEY*: *Electronic Controls as Applied to Air Conditioning* was the subject of the November guest speaker.

In opening his remarks, W. T. E. Duncan, manager, Commercial Division, Minneapolis-Honeywell Regulator Co., Ltd., Toronto, Ont., extended greetings from the Toronto Chapter, of which he is a member. He stated that his subject was basically intended to cover the problem of adequate temperature control of central air-conditioning systems. Mr. Duncan went on to say that electronic controls are not radically new and that many devices had been developed back as far as 1939. Prior to modern radar, such items as automatic temperature operators and indicators for special process machines had been developed for industrial use. Mr. Duncan also reviewed mechanical electric proportioning controls. In conclusion, he stated that electronic controls fill a need for better system stability and smoother integrated control, most of which can be regulated from a common control dial panel without the cumbersome manual re-settings of controllers spread all around the equipment.

Pres. E. J. Schoenherr announced that D. W. Banton had been named by the board of governors as the alternate delegate to the Chapters Conference Committee. Attendance 35. Attendance ratio 0.60.

• *PACIFIC NORTHWEST*: Secy. M. W. McKinstry reported at the December meeting, presided over by Pres. P. I. L. Winsor, that C. A. Anderson and the secretary had been appointed to the City of Seattle Refrigeration and Air Conditioning Advisory Committee by Mayor Allan Pomeroy.

L. F. Christofferson, first vice president and program chairman, introduced R. L. Grutzmacher, vice president, Natural Gas Equipment, Inc., Pasadena, Calif., who discussed *Application and Control of Natural Gas Fuel*. Carl Linde and M. C. Toliver assisted Mr. Grutzmacher during the question period. Attendance 44. Attendance ratio 0.32.

• *PHILADELPHIA*: P. H. Yeomans introduced J. G. Jackson, who presented, through the cooperation of *The American Patent Law Association*, a theoretical case concerning the first inventor of prestressed concrete beams. At this December meeting Pres. A. M. Robertson presided.

• *PITTSBURGH*: A panel discussion on *Fire Insurance, Pennsylvania State and Public School Regulations* was held at the November meeting. E. J. Busch, chairman, program committee, introduced the speakers. The first speaker, H. F. Lenz, consulting engineer from Johnstown, Pa., reported on the writing of codes, emphasizing the difficulties involved in revising a code after lengthy intervals. C. C. Anthony, Factory Insurance Association, discussed fire hazards and the beneficial aspects of fire drills. One of the chapter members, A. W. Marshall, senior engineer, Hartford Steam Boiler Inspection & Insurance Co., Pittsburgh, Pa., spoke on regulations covering pressure vessels and boilers. Questions from the floor received replies from one or more of the speakers.

A. W. Edwards, member of Council, presented a Life Membership certificate to F. C. McIntosh. Pres. C. L. Benn was the presiding officer. Attendance 99.

• *ROCKY MOUNTAIN*: The subject of the January presentation by J. A. Schenk, director of engineering, Alco Valve Co., St. Louis, Miss., was *Balancing a Refrigeration System with the Aid of Proper Flow Control Devices*. The topic attracted a large number of *ASRE* members to the meeting. Mr. Schenk outlined the basic theory and application of automatic expansion valves, thermostatic expansion valves, suction regulating expansion valves, thermostatic expansion valves, suction regulating valves and pressure limiting suction valves. A. S. Widdowfield introduced the speaker to the audience at this meeting presided over by Pres. L. L. DeLong.

• *ROCKY MOUNTAIN*: The Small Business Administration was the subject of the December guest speaker, Harold Smethills, regional manager of the Small Business Administration covering a four-state area. Following an introduction by A. S. Widdowfield, Mr. Smethills spoke of the trend of business to enlarged volume and warned small businesses not to overexpand. He described the functions of the Small Business Administration as twofold: the lending of money and procurement. Mr. Smethills' remarks were pertinent to our present day economy.

Secy. W. V. Burbank read a clipping from the *Boulder Camera* concerning the illness of B. H. Spurlock, Jr., and suggested that the members might wish to write to him in Lebanon. Pres. L. L. DeLong was the presiding officer. Attendance 24.

• *SACRAMENTO VALLEY*: Pres. R. A. Sarro presided at the January meeting. V. W. Thornburg introduced the speaker, J. C. Beckett, chief engineer, Wesix Electric Heater Co., San Francisco. Mr. Beckett's subject was *Ionization in Heating and Air Conditioning*. He also discussed the use of electric heating — its benefits, cost of operation and recent developments. Attendance 40. Attendance ratio 0.33.

• *ST. LOUIS*: An entertaining talk, *Gabriel Don't Blow Your Horn*, was given by Ross Shannon in December. J. G. Hamm presented the speaker.

Pres. E. T. Clucas introduced all attending past presidents, the officers and board of governors, and their wives, who were also present. Attendance 163.

• *SOUTH CAROLINA*: P. B. Gordon, second vice president of the Society, New York, N.Y., was guest speaker at the November meeting, presided over by Pres. R. K. Rouse. Introduced to the audience by R. A. Stipp, Vice President Gordon elaborated on the *Possibilities of Panel Cooling*. His presentation, which included a series of slides, pointed out some of the technical aspects of panel cooling, as well as comparing it with other methods of air conditioning. Vice President Gordon also mentioned some of the limitations of panel cooling and gave details of existing installations together with pictures of these installations. After a question and answer period, Vice President Gordon briefly described the activities of the Society and the benefits to the membership. Attendance 35. Attendance ratio 0.22.

• *SOUTH TEXAS*: Pres. F. M. Neil announced the appointment of C. V. Chenault, an elected member of the board of governors, to the position of treasurer to fill the unexpired term of R. S. Sandifer, who moved to Dallas. With the resignation from the board of governors of D. C. McNeil, who is moving out of the state, there were two openings to be filled. President Neil announced the appointment of H. C. Will and E. B. Appling to fill these vacancies on the board.

The program chairman of the evening, B. P. Fisher, introduced William Nestles, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., who talked on residential heating and air conditioning. Attendance 64.

• *SOUTHERN CALIFORNIA*: *Smog* was the subject of the January presentation by John Mills, Los Angeles Air Pollution District. Mr. Mills, who was introduced by G. D. Lord, program chairman, showed a film depicting the problems of smog and its 4 major sources. A half hour of discussion concluded the presentation.

Chairman H. B. Nottage, codes and standards committee, reported that a test installation, which is under construction, should be ready within a few months. A. J. Hess informed the gathering about preparations being made for a formal presentation of an invitation for the holding of a Society meeting in Los Angeles in 1960. Pres. J. L. McCullough presided. Attendance 62.

• *SOUTHERN CALIFORNIA*: G. D. Lord, program committee chairman, introduced C. B. Rowe, chief research engineer, Research Products Corp., Madison, Wis., at the meeting in December. Mr. Rowe gave an illustrated lecture on panel type air filters rating methods and equipment. The presiding officer was Pres. J. L. McCullough. Attendance 77.

• *SOUTHERN CALIFORNIA*: It was apparent from the large crowd attending the November meeting that the speaker was a controlling factor in drawing the members. D. D. Wile, chief engineer, Refrigeration Engineering, Inc., Los Angeles, gave an excellent talk on *Partial Load in Air-Conditioning Systems, an Engineering Problem*.

H. B. Nottage, chairman, codes and standards committee, reported that progress was continuing on the elimination of unnecessary fire dampers. A resolution was passed to extend an invitation to the Council of the Society to hold the 1960

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Annual Meeting in Los Angeles. A second motion was passed approving affiliation with the Los Angeles Technical Council, pending approval of the Society's Council. Attendance 116.

• *SOUTHERN PIEDMONT*: Program Committee Chairman J. R. Clark introduced the December guest speaker, R. B. Smithwick, The Texas Co., Charlotte, N.C. Mr. Smithwick's presentation covered *Petro-Chemistry*. Vice Pres. J. A. Rice presided. Attendance 17.

• *SOUTHERN PIEDMONT*: Prof. E. R. Queer, treasurer of the Society, University Park, Pa., gave his presentation on *Air Conditioning of Caves for Storage* at the November meeting. Program Chairman J. R. Clark presented the speaker.

Pres. L. F. Lawrence, Jr., presented a past president's pin to R. S. Fullerton. Attendance 29. Attendance ratio 0.28.

• *TOLEDO*: Pres. C. F. Hoffman presided at the December meeting. The speaker was R. L. Cone, Jr., manager, Toledo Sales Office, Owens-Corning Fiberglas Corp. He discussed methods of determining heat load on residential buildings. In his talk, Mr. Cone covered three methods of operation of equipment; continuous, short cycle and long cycle. Attendance 44.

• *WASHINGTON, D.C.*: A talk on *The Electric Hygrometer Method and Its Engineering Uses* was featured at the December meeting. The speaker, C. O. Ohlheiser, American Instrument Co., Silver Spring, Md., was introduced by L. H. Holder, program chairman. Mr. Ohlheiser's talk covered a history of the method, together with a description and a listing of its uses. Attendance 41.

• *WASHINGTON, D.C.*: Society Pres. John E. Haines, Minneapolis, Minn., gave an optimistic forecast on *The Next Ten Years* at the November meeting. Program Chairman L. H. Holder introduced President Haines, whose talk was well received.

Pres. W. C. Reamy asked for the introduction of guests, among whom was J. H. Van Alsburg, past president of the New Mexico Chapter. Attendance 59.

• *WEST TEXAS*: Pres. R. B. Carow turned the November meeting over to T. E. Eubank, who introduced C. S. Stock, manager, Herman Nelson Unit Vent Sales, American Air Filter Co., Inc., Louisville, Ky. Mr. Stock talked on *School Heating* and showed pictures of a test installation.

C. P. Houston, chairman, nominating committee, announced the recommended slate of nominees for 1956. Attendance 29. Attendance ratio 0.38.

• *WESTERN MASSACHUSETTS*: An illustrated lecture on high temperature drop hot-water heating for schools was given in November by Samuel Williams, development engineer, John J. Nesbitt, Inc., Philadelphia, Pa. A discussion period followed Mr. Williams' presentation. Vice Pres. J. E. Reed presided. Attendance 34. Attendance ratio 0.48.

• *WESTERN MICHIGAN*: In a talk in December on *Snow Melting Systems—Design and Operation*, W. P. Chapman, engineering sales service representative, National Tube Division, U. S. Steel Corp., Pittsburgh, Pa., advised that four conditions contribute to the design of a snow melting system. These are rate of snowfall, air temperature, wind velocity and relative humidity. Mr. Chapman, who was introduced to the audience by J. T. Anderson, also stated that all snow melting systems can be designed alike for a given locality.

F. K. Platt, chairman of the code committee, presented a written report on behalf of his committee. Attendance 56.

• *WISCONSIN*: The business portion of the December meeting, presided over by Pres. I. J. Rossiter, was omitted due to the large number of guests from *ASRE*.

E. W. Gifford introduced John Engalitcheff, Jr., president, Baltimore Aircoil Co., Inc., Baltimore, Md., who spoke on *Water Conservation Equipment*. Mr. Engalitcheff closed his discussion with a question and answer period, after which the chapter adjourned with a rising vote of thanks to the speaker. Attendance 51. Attendance ratio 0.20.

CANDIDATES FOR MEMBERSHIP

Listed here are the names of 128 men who are candidates for membership, or advancement in membership grade.

Members are requested to assume their full share of responsibility of receiving these candidates into membership by advising the Executive Secretary before March 31, 1956, of any whose eligibility for membership is questioned. Unless such objection is made these candidates will be voted upon by the Council.

NOTE: †Reinstatement *Advancement

Arizona (*Region* 4)

Meyer, W. B., Chief Engr., Frank Harmonson Co. Metal Products Inc., Phoenix.

California (*Region* 4)

Ball, A. J., Jr., Mech. Engr., Hertzka & Knowles, San Francisco.

Berkman, W. S., Sales Engr., Tennity & Co., Los Angeles.

Georgiou, T. S., Sales Engr., Worthington Corp., San Francisco.

Levine, A. Z.*, Partner, A. Z. Levine & R. J. McCann, Assoc. Mech. Engrs., Los Angeles.

MacCulloch, D. P., Sales Engr., Powers Regulator Co., Los Angeles.

Sullivan, J. W., Designer, Ralph E. Phillips, Inc., Los Angeles.

Weed, E. G.†, Dis. Mgr., Aerofin Corp., San Francisco.

Colorado (*Region* 3)

Bisbee, W. R., Sales Engr., Minneapolis-Honeywell Regulator Co., Denver.

Wills, J. H.*, Sales Engr., Richards & Assocs., Denver.

Connecticut (*Region* 1)

Cosentino, H. A., Sales Engr., Johnson Service Co., W. Hartford.

Young, W. A., Repr., Joseph Simons Co., Hartford.

Delaware (*Region* 1)

McIntire, J. L.†, Service Supervisor, E. I. DuPont de Nemours & Co., Inc., Wilmington.

District of Columbia (*Region* 5)

Philipps, J. F.*, Coordinator of Education and Training, *United Association of Journeymen and Apprentices of Plumbing and Pipe Fitting Industry*, Washington.

Shefferman, S. M., Partner, Shefferman, Luchenburg & Bigelson, Washington.

Georgia (*Region* 5)

Caldwell, F. D., Designer, Harold A. Ammons, Cons. Engr., Atlanta.

Illinois (*Region* 2)

Carlson, R. A., Owner, Richard A. Carlson Plumbing & Heating Co., Elgin.

Hill, J. B., Vice Pres., L. C. Kohlman, Inc., Chicago.

Kastholm, John, Jr., Sales Engr., The Powers Regulator Co., Chicago.

Sorensen, J. E., Br. Mgr., Weil-McLain Co., Chicago.

Tolson, C. G., Engrg. Product Mgr., American Air Filter Co., Herman Nelson Div., Moline.

Iowa (*Region* 3)

Bierwirth, H. C., Jr., Chief Engr., Com. Div., Lennox Furnace Co., Marshalltown.

Carstens, H. K., Partner, Carstens Bros., Ackley.

Gibson, R. C., Vice Pres., Gibson-Townsend Co., Des Moines.

Rich, D. A., Sales Engr., Iowa Sheet Metal Contractors, Inc., Des Moines.

Kansas (*Region* 3)

Carrier, V. E., Engr., E. E. Hysom & Assocs., Wichita.

Exley, T. R., Design Engr., The Coleman Co., Inc., Wichita.

Jones, R. A., Office Engr., Ryan Engineering Co., Salina.

Weills, N. D., Acting Dir. of Research, The Coleman Co., Inc., Wichita.

Kentucky (*Region 5*)

Sawyer, A. H., Pres., Cranfill-Frey Co., Lexington.

Wright, C. D., Dist. Mgr., Air Filter Dept., American Air Filter Co., Louisville.

Louisiana (*Region 5*)

Birdsong, F. A., Mfrs. Repr., New Orleans.
Doherty, L. S.†, Owner, Doherty-Silentaire Co., Baton Rouge.

Griffin, H. L., Co-owner and Mgr., United Engineering Co. of Louisiana, Baton Rouge.

Neely, E. E., Dist. Mgr., Marshall, Neil & Pauley, Inc., New Orleans.

Louisiana (*Region 6*)

Light, J. M., Appliance Service Advisor, Southwestern Gas & Electric Co., Shreveport.

Massachusetts (*Region 1*)

Clock, S. E., Mech. Engr., Ganteaume & McMullen, Boston.

Geany, J. J., Sales Engr., American Blower Corp., Boston.

Giterg, Harry, Engr., Simons Burner & Petroleum Corp., Springfield.

Michigan (*Region 2*)

Prentice, D. L., Jr.†, Pres., Dale L. Prentice Co., Detroit.

Missouri (*Region 3*)

Dworkin, Archie, Engr., S. C. McCann Co., Kansas City.

Johnson, V. K., Sales Engr., American Blower Corp., Kansas City.

Shortal, C. F., Dist. Mgr., J. F. Pritchard & Co. of California, Kansas City.

Montana (*Region 3*)

Drapes, A. G., Cons. Engr., Great Falls.
Harrison, J. D., Sales Engr., Johnson Service Co., Great Falls.

Hoiland, A. C., Partner, Hoiland & Lund, Archts., Great Falls.

Klemens, J. R., Pres., A. T. Klemens & Son, Great Falls.

Schuelke, L. O., Mgr., Heating Dept., Montana Air Conditioning Co., Bozeman.

New Jersey (*Region 1*)

Altshuler, Herbert, Repr., Liberty Fuel Oil Co., Climate Control Prod. Div., Newark.

Bloch, R. L., Mech. Engr., Tectonic Assocs., Somerville.

Dabinett, H. R., Jr., Sales Repr., Warren Webster & Co., Newark.

Freundlich, E. A., Mech. Engr., Wigton-Abbott Corp., Newark.

Kasmer, T. C., Supvsr. of Honeywell Service, Minneapolis-Honeywell Regulator Co., Union.

McLaughlin, T. V., Engrg. Asst., Public Service Electric & Gas Co., Newark.

Nitzberg, S. H.*, Pres., Atlantic Pipe-bending & Fabricating Corp., Wood-Ridge.

Noble, D. K., Mgr., Application Engrg., Warren Webster & Co., Camden.

Pratt, J. N.*, Sr. Engr., Warren Webster & Co., Camden.

Reese, W. A., Mech. Engr., Finne & Finne, Archts., Elizabeth.

Solmor, Robert, Asst. Chief Engr., Chas. Simkin & Sons, Inc., Perth Amboy.

New Mexico (*Region 6*)

Braid, D. J. Jr., Engr., University of California, Scientific Laboratory, Los Alamos.

New York (*Region 1*)

Brucker, John, Jr., Sales Engr., Warren Webster & Co., Buffalo.

Churan, J. F.†, Mech. Engr., Joseph L. Ottenheimer, Cons. Engr., Albany.

Ireland, N. J., Engr., Behr-Manning Corp., Troy.

Magner, R. M., Dist. Sales Mgr., Niagara Blower Co., Buffalo.

McLaughlin, H. J., Vice Pres., E. J. Eddy, Inc., Buffalo.

O'Mahony, W. J., Jr., Engr., Arctic Engineering Co., New York.

Phillips, E. E., Treas., Engr., Craig Air Conditioning Corp., Schenectady.

Roske, F. M.†, Field Engr., Chrysler Airtemp Sales Corp., New York.

Sperlik, C. E., Technical Advisor, Revere Copper & Brass, Inc., Rome.

Wechter, S. H., Engr., Heating Maintenance Corp., New York.

Zehnder, N. A., Chief Engr., Sulzer Brothers, Ltd., New York.

Ohio (*Region 2*)

Carey, J. W., Territorial Mgr., Richard Equipment Co., Columbus.

Carozza, Nicholas, Vice Pres.-Supvsr., General Jackson Heating & Air Conditioning, Dayton.

Daugherty, R. J.†, Htg. Engr., Integrity Supply, Inc., Columbus.

Galvin, T. R., Repr., Owens-Corning Fiberglas Corp., Cleveland.

Hepner, R. M.†, Pres., Hepner Air Filter Service, Inc., Cleveland.

Higgins, M. A., Sales Repr., The Trane Co., Cleveland.

Hughes, F. S., Engr., William D. Ehlers, Cons. Engr., Cincinnati.

Perkins, R. J.*, Sales Engr., The American Blower Corp., Centerville.

Schneider, A. H., Mech. Engr., E. C. Landberg & Assoc., Cincinnati.

Shaw, E. E., Supvsr., Hotze Heating Co., Cincinnati.

Oklahoma (*Region 6*)

Jaeger, K. S., Asst. Chief Engr., Webster Engineering Co., Tulsa.

Oregon (*Region 4*)

Lokey, E. R.*, Owner, Ed Lokey & Co., Portland.

Pennsylvania (*Region 1*)

Culp, H. R., Jr., Mech. Engr., Water Dept., City of Philadelphia, Philadelphia.

South Carolina (*Region 5*)

Bates, C. M., Jr., A-C Engr., Amerotron Corp., Williamston.

Gillespie, F. H., Mech. Engr., Lockwood Greene Engineers, Inc., Spartanburg.

Mangan, D. J., Br. Mgr., Reamer Industries, Inc., Greenville.

Parsons, J. H., Jr., Engr., M. R. Durlach & Assoc., Cons. Engr., Columbia.

Tennessee (*Region 5*)

Avery, G. H., Jr., Owner, G. H. Avery Co., Memphis.

Turner, T. H., Jr., Engr., Hughes Heating Co., Memphis.

Texas (*Region 6*)

Abbott, G. T., Jr., Mgr., Carrier-Bock Co., Fort Worth.

Cohn, Harry, Engr., Fort Worth Pipe and Supply Co., Fort Worth.

Pecena, W. L., Pres., Lone Star Supply & Equipment Co., Inc., Dallas.

Segall, Bernard, Cons. Engr., Austin.

Virginia (*Region 5*)

Gustin, J. A.*, J. A. Gustin & Assocs., Cons. Engrs., Martinsville.

Washington (*Region 4*)

Weber, W. E., Field Service Engr., A. M. Byers Co., Seattle.

Wisconsin (*Region 2*)

McMahon, W. R., Chief Engr., Modine Manufacturing Co., Racine.

Resnick, M. A., Design Engr., Louis Resnick, Cons. Engr., Milwaukee.

Canada (*Region 7*)

Allum, E. D., Design Draftsman, Wiggs, Walford, Frost & Lindsay, Montreal, Que.

Bacon, R. H., Dist. Mgr., Combustion & Power Equipment, Ltd., Toronto, Ont.

Baylis, A. E., Sales Engr., J. C. Thompson, Vancouver.

Broadbent, W. B., Sales & Service Supvsr., T. C. Chown, Ltd., Montreal, Que.

Fisher, R. M., Asst. Appl. Engr., Trane Company of Canada, Ltd., Toronto, Ont.

Grimshaw, J. D. A., Repr., S. A. Armstrong, Ltd., Toronto, Ont.

Hastings, T. C., Sales Mgr., Howard Furnace & Foundries, Ltd., Toronto, Ont.

Hemphill, J. L., Sales Engr., Darling Brothers, Ltd., Toronto, Ont.

Holmes, G. A., Estimator, Morton Mitchell Specialties, Ltd., Vancouver, B.C.

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Lang, B. E., Sales Engr., Canadian Blower & Forge Co., Ltd., Toronto, Ont.

McIlmurray, B. P., Sales Repr., Howard Air Conditioning and Heating Co., Ltd., Toronto, Ont.

Pfenninger, Jakob, Design Engr., D. W. Thomson, Cons. Engr., Vancouver, B. C.

Richter, R. E., Appl. Engr., Anthes-Imperial Co., Ltd., Toronto, Ont.

Quinlan, H. D., Sales Mgr., Ontor Laboratory, Ltd., Toronto, Ont.

Rispler, Lorne, Sales Engr., Minneapolis-Honeywell Regulator Co., Ltd., Ottawa, Ont.

Ruppel, H. W., Sales Engr., J. B. Allen & Co., Ltd., Kitchener, Ont.

Shipley, Edwin, Chief Draftsman, Howard Air Conditioning & Heating Co., Ltd., Toronto, Ont.

Stevens, P. D., Mgr., George Hardy Sales, Ltd., Toronto, Ont.

Stubley, R. D., Cons. Engr., Thornhill, Ont.

Taylor, J. S., Sales Repr., Howard Air Conditioning and Heating Co., Ltd., Toronto, Ont.

Thomson, F. W., Sales Mgr., Lennox Furnace Co. (Canada), Ltd., Toronto, Ont.

Wiggins, W. F.*, Minneapolis-Honeywell Regulator Co., Ltd., Vancouver, B. C.

Chile

Ruiz-Gil, Donato*, Chief of Indus. Hygiene, National Health Service, Santiago.

England

Greatorex, J. E.†, J. E. Greatorex & Partners, London.

Thomas, A. E.†, Mgr., Htg. Engrg. Dept., Charrington, Gardner, Locket & Co., Ltd., London.

Germany

Kurth, Robert, Engr., Anemostat Raumlufttechnik, GmbH, Cologne.

India

Bakshi, M. N., Appl. Engr., Blue Star Engineering Co., Ltd., Bombay.

OBITUARIES

T. B. HUNTER, JR.
San Francisco, Calif.

Thomas B. Hunter, Jr., 75, consulting engineer, San Francisco, was found dead in his home on December 26, 1955. Mr. Hunter was a member of the Society since 1941.

Born in Elkton, Md., on November 20, 1880, Mr. Hunter was a graduate of Stanford University with a B.A. in engineering in 1904. His first employ after graduation was as resident engineer, Pacific Improvement Co., and as superintendent with the Monterey County Water Works and the Monterey County Gas and Electric, Monterey, Calif. From 1912-13 he was chief engineer for the San Diego Exposition, San Diego, Calif. The following year, he started as senior member of the firm, Hunter & Hudson, consulting engineers, San Francisco. More recently, he had a consulting business on his own.

His work covered numerous buildings for Stanford University, and the University of California at Berkeley and at Los Angeles. He also served as a consulting engineer for the building of the municipal auditorium in San Francisco and the city hall and auditorium in Pasadena, Calif.

Surviving are two sons, Hale Van Barcaloo Hunter and Thomas B. Hunter III, both of San Anselmo, Calif.

HERMAN NELSON, HEATING AND VENTILATING PIONEER, DIES

Herman W. Nelson, 79, a pioneer in the heating and ventilating business, died on January 11 in his home in Moline, Ill., after a long illness. Mr. Nelson, a Life Member of the Society, was founder of the company which bore his name until it merged with the American Air Filter Co., Inc. in 1950.

The Moline Vacuum Heating Co., which later became known as the Herman Nelson Corp., was founded by Mr. Nelson in 1906. He served the company as president and general manager, and was chairman of the board at the time of his retirement in 1949. He was recognized as a leader in the development of modern heating and ventilating methods for schools.

Born in Orion, Henry County, Ill., on January 17, 1876, Mr. Nelson's first experience in the field was with the Moline Heating & Construction Co. After he joined the Society in 1909, he was active in gaining new members. He was one of the founders of the Rotary Club in Moline, and held membership in the Rock Island Arsenal Golf Club, the Elks and Davenport Outing Club. He was a member of the first Congregational Church.

Surviving are his wife, Agnes; a daughter, Mrs. Harry Sosnoski, Washington, D.C.; two sons, Richard, of San Rafael, Calif., and Robert, Louisville; a brother, F. A. Nelson, of Moline; six grandchildren and one great-grandchild.

AMERICAN SOCIETY OF

OFFICERS and COUNCIL

President	John W. James
First Vice President	P. B. Gordon
Second Vice President	E. R. Queer
Treasurer	R. A. Sherman
Executive Secretary	A. V. Hutchinson

Three Years: A. B. Algren, John Everetts, Jr., J. N. Livermore, J. H. Ross.

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(61 Chapters; 1 Special Branch; 6 Student Branches)

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ARIZONA

Arizona: 1953. Hdqrs., Phoenix. Meets, 1st Mon. PRES, W. A. Biddle, 3817 N. 15th Ave. SECY, E. P. Maxwell, 39 W. Adams St.

ARKANSAS

Arkansas: 1952. Hdqrs., Little Rock. Meets, 3rd Tues. PRES, J. L. Brown, 212 Terminal Warehouse Bldg. SECY, H. H. Himstedt, 510 E. Third St.

CALIFORNIA

Golden Gate: 1937. Hdqrs., San Francisco. Meets, 1st Thurs. PRES, D. E. McLeod, 2415 Green St. (23). SECY, Herb Duncan, 938 N. Linden Ave., South San Francisco.

Sacramento Valley: 1952. Hdqrs., Sacramento. Meets, 1st Wed. PRES, R. A. Sarro, 5412 Argo Way (21). SECY, M. J. Delavan, 405 Meister Way (19).

Southern California: 1930. Hdqrs., Los Angeles. Meets, 1st Tues. PRES, J. L. McCullough, 1978 S. Los Angeles St. (11). SECY, W. J. Biggar, 6620 Telegraph Rd. (22).

COLORADO

Rocky Mountain: 1944. Hdqrs., Denver. Meets, 1st Wed. PRES, L. L. DeLong, 2027 S. Washington St. (10). SECY, W. V. Burbank, P.O. Box 840.

CONNECTICUT

Connecticut: 1940. Hdqrs., New Haven. Meets, 3rd Thurs. PRES, E. J. Hoagland, 257 Whitney St., Hartford. SECY, J. D. Pierce, 775 Capitol Ave., Hartford.

DISTRICT OF COLUMBIA

Washington: 1935. Hdqrs., Washington, D.C. Meets, 2nd Wed. PRES, W. C. Reamy, Jr., 720 Mills Bldg. (6). SECY, S. H. Robbins, Jr., 2117 M Street, N.W. (7).

GEORGIA

Atlanta: 1937. Hdqrs., Atlanta. Meets, 2nd Mon. PRES, T. A. Barrow, Jr., 302 Ponce de Leon Ave., N.E. (8). SECY, J. A. Marshall, 1415 Howell Mill Rd., N.W.

ILLINOIS

Illinois: 1906. Hdqrs., Chicago. Meets, 2nd Mon. PRES, G. G. Freyder, 72 W. Adams St. (90). SECY, Herbert Kreisman, 117 N. Desplaines St. (6).

INDIANA

Indiana: 1943. Hdqrs., Indianapolis. Meets, 4th Tues. PRES, J. W. Jackson, 1531 N. Pennsylvania St. (2). SECY, G. W. Vogel, 31 E. Georgia St. (4).

IOWA

Iowa: 1940. Hdqrs., Des Moines. Meets, 2nd Tues. PRES, G. J. Kraai, 907 Sixth Ave. (14). SECY, W. A. Schworm, Physical Plant Dept., Iowa State College, Ames.

KANSAS

Kansas: 1951. Hdqrs., Wichita. Meets, Tues. after 1st Mon. PRES, A. B. Newton, 3511 Elmwood Dr. (17). SECY, T. L. Roberts, 2008 S. Parkwood Lane (18).

KENTUCKY

Bluegrass: 1954. Hdqrs., Louisville. Meets, 2nd Mon. PRES, W. M. Pace, 218 Don Allen Rd. (7). SECY, R. B. Duggan, 41 Beechwood Rd., Jeffersonville, Ind.

LOUISIANA

Baton Rouge: 1955. Hdqrs., Baton Rouge. Meets, 3rd Wed. PRES, C. S. Woodruff, P.O. Box 358. SECY, A. J. Mayers, Jr., 7732 Goodwood Ave.

Delta: 1939. Hdqrs., New Orleans. Meets, 3rd Tues. PRES, W. B. Martin, Jr., 635 Commercial Pl. (12). SECY, R. K. Goode, 4052 Thalia St. (25).

Shreveport: 1948. Hdqrs., Shreveport. Meets, 3rd Thurs. PRES, R. S. Segall, 848 River Rd. SECY, A. L. Jones, Jr., 753 Gladstone.

MARYLAND

Baltimore: 1949. Hdqrs., Baltimore. Meets, 3rd Wed. PRES, E. J. Morris, 813 N. Calvert St. (2). SECY, E. J. Dall, 1122 N. Charles St. (1).

MASSACHUSETTS

Massachusetts: 1912. Hdqrs., Boston. Meets, 3rd Tues. PRES, G. D. Fife, 79 Milk St. SECY, R. F. Curry, 80 Ripley St., Newton Centre (59).

Western Massachusetts: 1955. Hdqrs., Springfield. PRES, R. E. Cross, 114 Boston Rd. SECY, F. A. Ferraro, 172 Chestnut St.

MICHIGAN

Michigan: 1916. Hdqrs., Detroit. Meets, 1st Mon. after 10th of month. PRES, D. S. Falk, 4864 Woodward Ave. (1). SECY, J. H. Spitzley, 1200 W. Fort St. (26).

Western Michigan: 1931. Hdqrs., Grand Rapids. Meets, 2nd Mon. PRES, S. M. Paganelli, 47 N. Division Ave. SECY, B. J. Walter, 333 Fuller Ave., N.E.

MINNESOTA

Minnesota: 1918. Hdqrs., Minneapolis. Meets, 1st Mon. PRES, J. S. Locke, 2753 Fourth Ave., S. (8). SECY, F. G. Vogt, 6530 W. Lake St. (16).

MISSISSIPPI

Mississippi: 1953. Hdqrs., Jackson. Meets, 4th Mon. PRES, B. L. Palmer, 1808 N. Mill St. (2). SECY, M. F. Knipp, Jr., 2858 Arbor Hill Dr. (4).

MISSOURI

Kansas City: 1917. Hdqrs., Kansas City. Meets, 1st Mon. PRES, A. S. Hurt, Jr., 3601 E. 18th St. (27). SECY, S. C. McCann, 210 W. Tenth St. (5).

St. Louis: 1918. Hdqrs., St. Louis. Meets, 2nd Tues. PRES, E. T. Clucas, 4354 Olive St. SECY, N. J. Hubbuch, Jr., 7020 Cornell, University City (5).

NEBRASKA

Nebraska: 1940. Hdqrs., Omaha. Meets, 2nd Tues. PRES, T. E. Davis, 4303 Dodge St. SECY, C. A. Failer, 1802 Mason St. (2).

NEW JERSEY

North Jersey: 1952. Hdqrs., Newark. Meets, 2nd Tues. PRES, C. H. Smith, 2300 N. Stiles St., Linden. SECY, M. C. Christesen, 196 Everett Pl., Englewood.

NEW MEXICO

New Mexico: 1954. Hdqrs., Albuquerque. Meets, 3rd Mon. PRES, H. F. Munn, 419 Granite, N.W. SECY, J. K. James, 4462 Avenida del Sol.

NEW YORK

Central New York: 1944. Hdqrs., Syracuse. Meets, 4th Wed. PRES, L. A. Childs, 308 Forest Hill Dr. (6). SECY, Merle Weninger, 230 Goodrich Ave. (5).

Empire State Capital: 1951. Hdqrs., Albany. Meets, 2nd Wed. PRES, L. V. Appleby, N. Pearl & Van Woert Sts. (4). SECY, E. J. Mahoney, 45 Colvin Ave.

New York: 1911. Hdqrs., New York. Meets, 3rd Mon. PRES, Albert Giannini, 385 Madison Ave. (17). SECY, Carl H. Flink, 62 Worth St. (13).

Western New York: 1919. Hdqrs., Buffalo. Meets 2nd Mon. PRES, C. W. Kaupp, 271 Delaware Ave. (2). SECY, J. P. Guerra, 34 E. Depew Ave. (14).

NORTH CAROLINA

Northern Piedmont: 1952. Hdqrs., Greensboro. Meets, 2nd or 3rd Fri. PRES, L. R. Gorrell, 1412 Chester Rd., Raleigh. SECY, C. E. Amick, 1042 Oakmont Ave.

Southern Piedmont: 1952. Hdqrs., Charlotte. PRES, J. A. Rice, 719 E. Worthington Ave. SECY, E. D. Streng, 1115 E. 10th St. (4).

OHIO

Central Ohio: 1944. Hdqrs., Columbus. Meets, 3rd Mon. PRES, R. A. Wilson, 2240 N. High St. SECY, T. R. Walker, 182 N. Yale Ave.

Cincinnati: 1932. Hdqrs., Cincinnati. Meets, 1st Tues. PRES, A. H. Gerdsen, 224 E. Second St. (2). SECY, T. D. Reiley, 1905 Dunlap St. (14.)

Miami Valley: 1950. Hdqrs., Dayton. Meets, 1st Wed. PRES, D. E. Tullis, 1720 Parkhill Drive (6). SECY, L. P. Brehm, Jr., 111 S. Broomfield Rd.

Northern Ohio: 1916. Hdqrs., Cleveland. Meets, 2nd Mon. PRES, L. C. Burkes, 1792 E. 40th St. SECY, R. A. Urban, Sr., 1740 E. 12th St. (14).

Toledo: 1954. Hdqrs., Toledo. PRES, C. F. Hoffman, 523 Spitzer Bldg. (4). SECY, R. I. Fruth, 1316 Adams St. (2).

OKLAHOMA

Oklahoma: 1935. Hdqrs., Oklahoma City. Meets, 2nd Mon. PRES, J. R. Patten, 1726 N.W. Fifth (6). SECY, A. C. Shelley, 2946 Nimitz (12).

Northeastern Oklahoma: 1948. Hdqrs., Tulsa. Meets, 2nd Tues. PRES, H. W. Meinholtz, Box 2261. SECY, H. L. Cauvel, 3629 S. New Haven.

OREGON

Oregon: 1939. Hdqrs., Portland. Meets, Thurs. after 1st Tues. PRES, Dick Blankenship, Cascade Bldg. (4). SECY, W. B. Hayes, 707 Portland Trust Bldg. (4).

PENNSYLVANIA

Philadelphia: 1916. Hdqrs., Philadelphia. Meets, 2nd Thurs. PRES, A. M. Robertson, 1200 Locust St. (7). SECY, J. J. Hucker, 355-C Lancaster Ave., Haverford.

Pittsburgh: 1919. Hdqrs., Pittsburgh. Meets, 3rd Mon. PRES, C. L. Benn, 420 Blvd. of Allies (19). SECY, E. H. Riesmeyer, Jr., 231-33 Fort Pitt Blvd. (22).

SOUTH CAROLINA

South Carolina: 1954. Hdqrs., Columbia. PRES, R. K. Rouse, P.O. Box 3731, Greenville. SECY, B. A. Leppard, P.O. Box 3353, Station A, Greenville.

TENNESSEE

Memphis: 1944. Hdqrs., Memphis. Meets, 3rd Mon. PRES, John Hilton, II, 4443 Sequoia. SECY, L. V. Eberle, Jr., 1358 Clementina.

TEXAS

North Texas: 1938. Hdqrs., Dallas. Meets, 3rd Mon. PRES, H. G. Gregerson, 4512 Livingston (5). SECY, Ross Zumwalt, 929 Mercantile Securities Bldg. (1).

South Texas: 1938. Hdqrs., Houston. Meets, 3rd Fri. PRES, F. M. Neil, P.O. Box 13197 (19). SECY, A. B. Ullrich, 2520 Huldy St. (19).

Southwest Texas: 1946. Hdqrs., San Antonio. Meets 3rd Tues. PRES, F. B. Frazee, 1013 Riverside Dr., Austin (4). SECY, J. L. Rea, Jr., 300 West 8th St., Austin.

West Texas: 1953. Hdqrs., Lubbock. Meets, 1st Tues. PRES, J. C. Wharton, P. O. Box 1240. SECY, D. G. Halley, 3608 Ave. A.

UTAH

Utah: 1944. Hdqrs., Salt Lake City. Meets, 3rd Thurs. PRES, R. C. Evans, 2549 Wilmington Ave. (6). SECY, G. E. Wright, Jr., Dooly Bldg.

VIRGINIA

Virginia: 1946. Hdqrs., Norfolk. Meets, 3rd Wed. PRES, C. G. Conaway, Jr., 7454 Hank Ave. (5). SECY, E. R. Simpson, Jr., 720 Guy St.

WASHINGTON

Inland Empire: 1950. Hdqrs., Spokane. Meets, 1st Mon. PRES, F. W. Jenkinson, 228 Hutton Bldg. SECY, J. A. Doyle, W. 3018 Broad.

Pacific Northwest: 1928. Hdqrs., Seattle. Meets, 2nd Tues. PRES, P. I. L. Winsor, 20031 Marine View Dr., S.W. (66). SECY, M. W. McKinstry, 4017 McGilvra St. (2).

WISCONSIN

Wisconsin: 1922. Hdqrs., Milwaukee. Meets, 3rd Mon. PRES, I. J. Rossiter, 231 W. Wisconsin Ave. (3). SECY, R. D. Rodwell, 152 W. Wisconsin Ave. (3).

CANADA

British Columbia: 1952. Hdqrs., Vancouver. Meets, 2nd Wed. PRES, Cornelius Van Boeyen, 636 Drake St. (3). SECY, A. C. Martin, 425 W. Second Ave.

Manitoba: 1935. Hdqrs., Winnipeg. Meets, 4th Thurs. PRES, G. C. Davis, 212 Waverly St. (9). SECY, A. H. Millar, 342 Mandeville St., St. James (12).

Montreal: 1936. Hdqrs., Montreal. Meets, 3rd Mon. PRES, R. J. Ker, 5000 Namur St. (9). SECY, W. E. Jarvis, P.O. Box 61.

Ontario: 1922. Hdqrs., Toronto. Meets, 1st Mon. PRES, D. L. Angus, 25 Bayview Wood. SECY, H. R. Roth, 57 Bloor St., W.

Ottawa Valley: 1952. Hdqrs., Ottawa. Meets, 3rd Tues. PRES, E. J. Schoenherr, 32 Clarey Ave. (1). SECY, C. W. Watson, 102 Bank St.

SPECIAL BRANCH

Switzerland: 1952. Hdqrs., Zurich. PRES, Walter Hausler, Erbstrasse 2, Kusnacht. SECY, L. F. de Bruyn, Muhlebachstrasse 172 (8).

STUDENT BRANCHES

North Carolina State College: 1948. Hdqrs., Raleigh. PRES, R. E. Crawford, 106½ Logan Ct. SECY, S. R. Moore, Box 4317, State College.

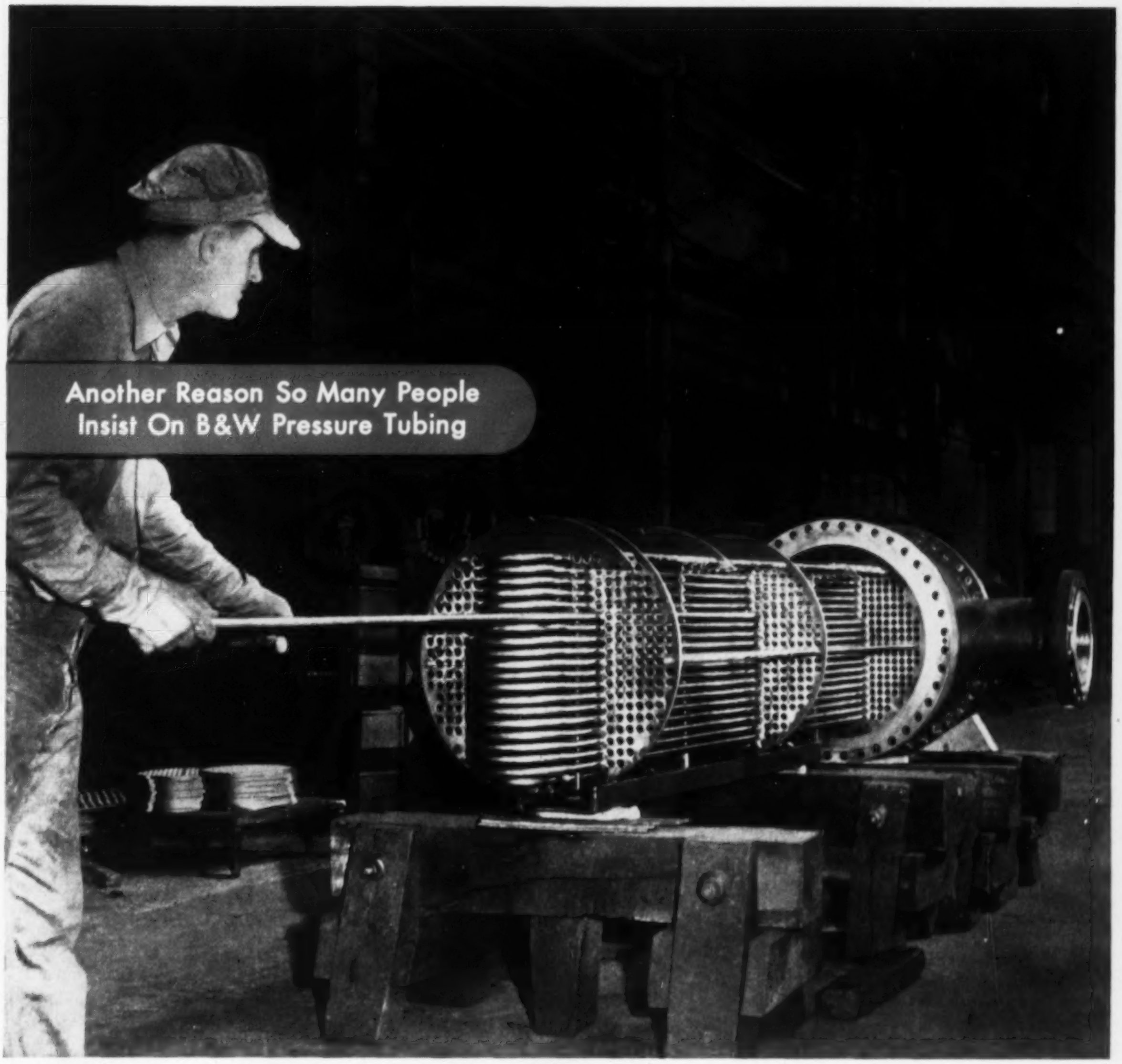
Oregon State College: 1949. Hdqrs., Corvallis. Meets, 1st Wed. after 1st Tues. PRES, P. I. Anderson, 202 N. 10th. SECY, D. W. Strahan, 233 Mall St.

Purdue University: 1948. Hdqrs., W. Lafayette, Ind. PRES, D. B. Doucette, Purdue Student Branch, ASHAE, School of Mech. Engrg. SECY, J. W. Deabler, Purdue Student Branch, ASHAE, School of Mech. Engrg.

Texas A. & M. College: 1946. Hdqrs., College Station. Meets, 2nd and 4th Tues. PRES, D. F. Carroll, Box 6264. SECY, C. W. Farrar, Jr., Rt. 1, Box 339, Bryan.

University of Detroit: 1949. Hdqrs., Detroit. Meets, 1st Tues. PRES, L. J. Hayes, Jr., 16254 Santa Rosa Dr. (21). SECY, E. F. Hoelscher, Jr., 14283 Cherrylawn (38).

University of Toronto: 1951. Hdqrs., Toronto. PRES, C. F. Smale, 347 Kennedy Ave. (9). SECY, T. D. Digel, 204 King St., Weston.



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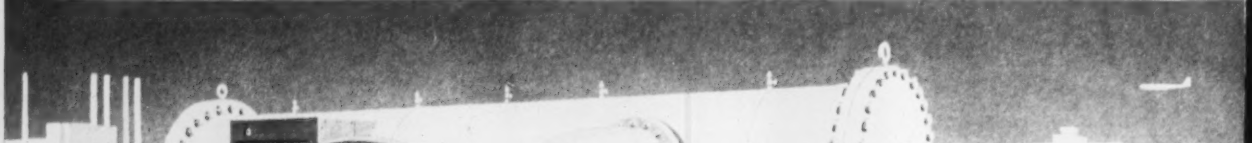
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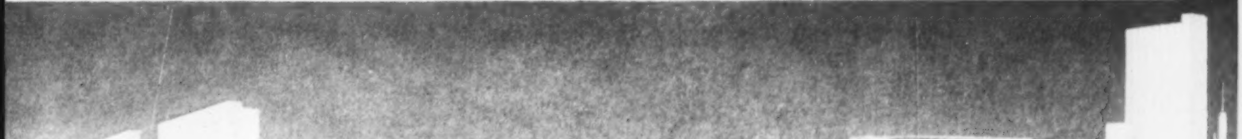
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THE "EASIER" BOILER

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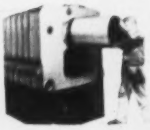
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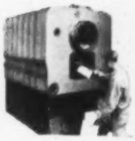
Easier to enlarge capacity

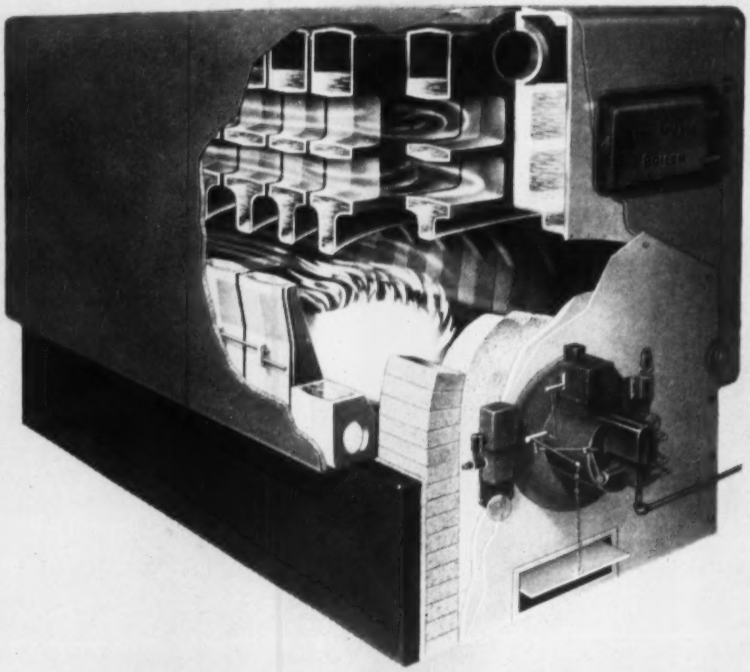

Easier to build combustion chamber

Easier to install burner on special steel front plate

It is also easy to see why the Weil-McLain "HR" Series Boiler is completely outstanding for commercial, institutional and industrial installations.

This boiler was designed in cooperation with leading manufacturers of horizontal rotary oil burners and has their approval. The extra large combustion volume, greater primary heating surface, low heat release and balanced flue gas travel are among the features which contribute to highly efficient combustion and heat absorption. That's why the "HR" Boiler most effectively develops the economies obtainable with low-cost, heavy oils.

Cast iron sectional construction offers easier erection... less required space... easy enlargement of capacity... low maintenance cost and longer life. The special steel front of the "HR" greatly simplifies installation of the burner. A Weil-McLain "*extra value*" in every detail!



WEIL-McLAIN

HR SERIES BOILERS

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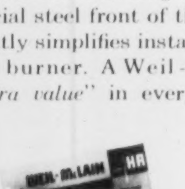

For complete data send for Bulletin C-188

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BOILERS · RADIATORS

Address Literature requests to Dept. AA-36

WEIL-McLAIN COMPANY
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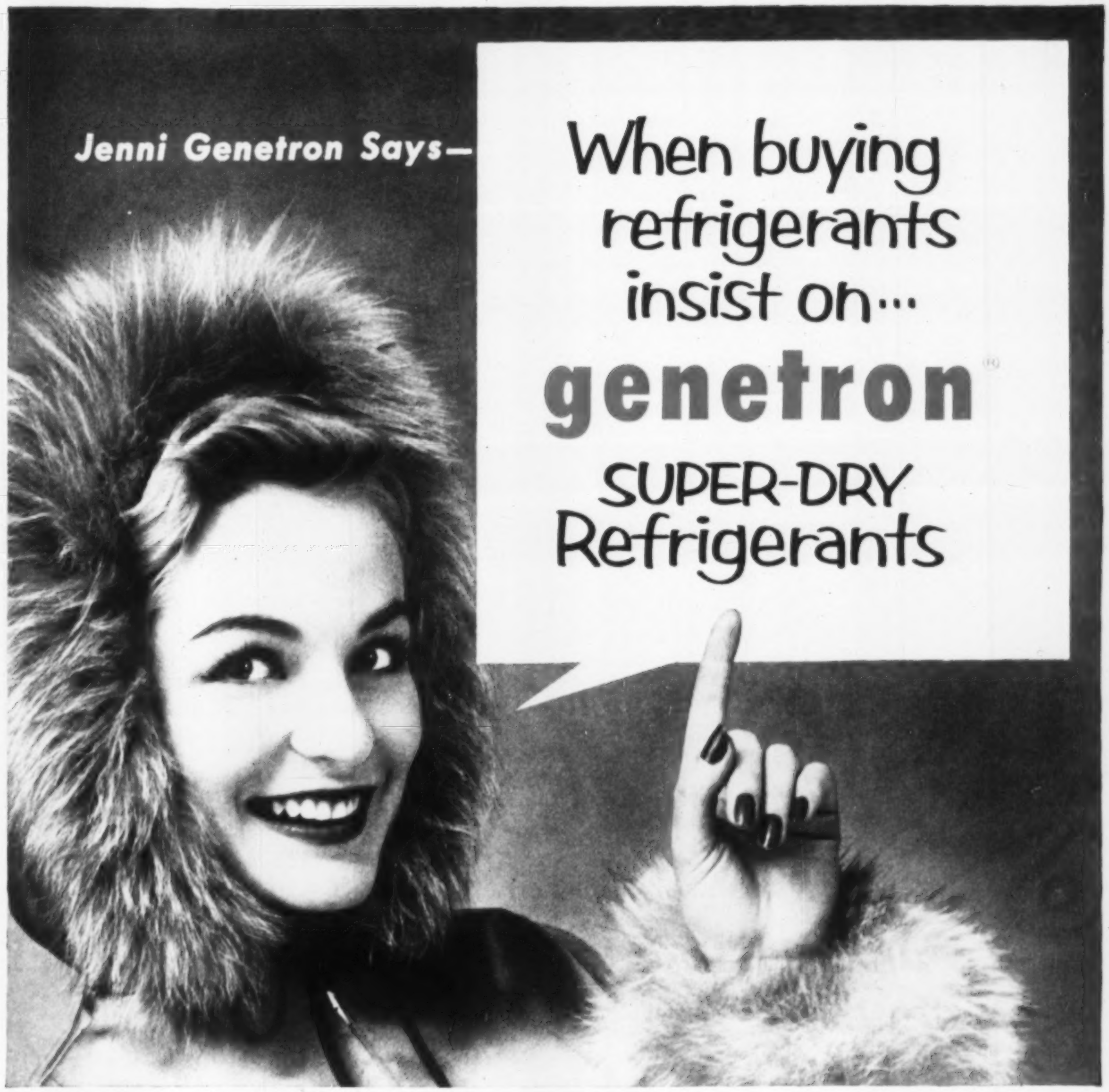
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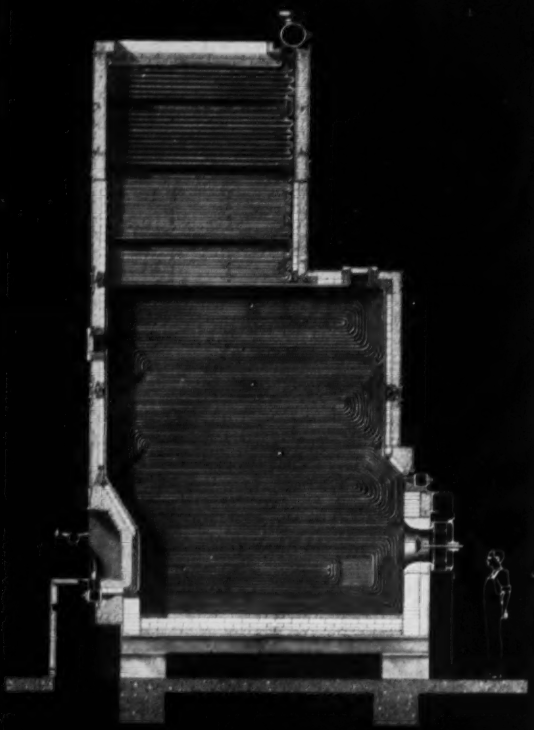


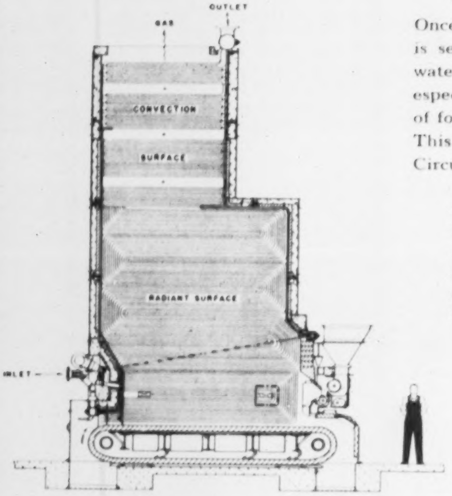
C-E LaMont Controlled Circulation Hot Water Boiler

EVER CONSIDER HIGH TEMPERATURE WATER FOR YOUR HEATING AND PROCESSING NEEDS?

Both steam and high temperature water have their place, and your particular requirements will determine which is best for you. In either case, the complete C-E line includes a type and size of boiler exactly suited to your needs. Where high temperature (HT) water seems indicated, it affords such important advantages as:

1. The higher available heat in HT water — many times that of steam at the same pressure.
2. Closer control of temperature.
3. Heat loss is lower with the HT water closed system . . . unused heat returns to the boiler . . . no condensate return lines.
4. No elaborate feedwater treatment required. Make-up requirements are exceptionally low.
5. Steam traps not required — trap problems and attendant expense are eliminated.
6. No blowdown losses . . . no safety valve vent losses . . . no condensate losses.

The planning of any new heating and/or processing system should include the consideration of a high temperature water system. There are many hundreds of HT water installations operating abroad and a rapidly growing number in the U.S.A. It may be *just right* for *your* requirements.



Advantages of the C-E "HT" Water Boiler

Once it is established that HT water is right for your needs, your next concern is selection of proper equipment. The C-E high pressure, high temperature water boiler has inherent advantages that make it the best possible choice. It is especially designed for HT water applications utilizing as it does the principle of forced, controlled circulation which is extended throughout the entire sytsem. This accounts for numerous points of superiority in the C-E LaMont Controlled Circulation Hot Water Boiler. Among these are:

1. Complete control over HT water movement in both system and boiler.
2. No separate boiler pump is required, since low pressure loss is inherent.
3. Pressurized operation with oil or gas means no induced draft fan.
4. Single-pass design — no baffles — means cleaner boiler and lower draft loss.
5. More efficient heating surface can be arranged because of controlled, positive circulation.
6. Any fuel — oil, gas, coal, or any combination of fuels.
7. Other features such as: gastight, welded steel casing . . . fewer headers, all of which are accessible.

The C-E LaMont Controlled Circulation Hot Water Boiler is available in sizes ranging from 10 to 200-million Btu per hour, or more, with pressures up to 500 psi and temperatures to 475 F — higher if required.

If you are in the market for a heating or process system — or expect to be — by all means investigate high temperature water and the C-E "HT" Water Boiler. Our engineers will be pleased to discuss the subject with you or your consultants. Write for our new catalog HT- 182.

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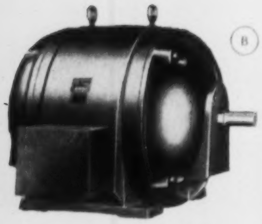
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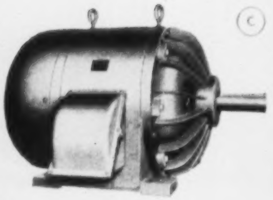
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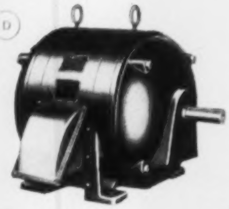
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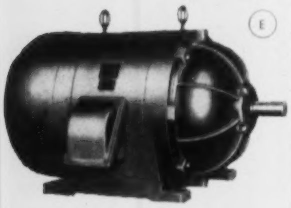
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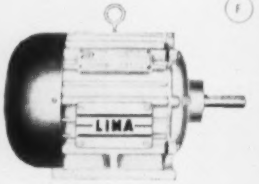
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A Lima Type RG, semi-enclosed, dripproof. Lima Type TE, totally enclosed, non-ventilated. NEMA frame sizes 66 to 254, new frames 182-286U.

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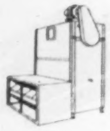

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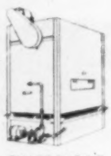

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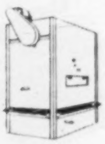

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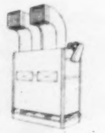

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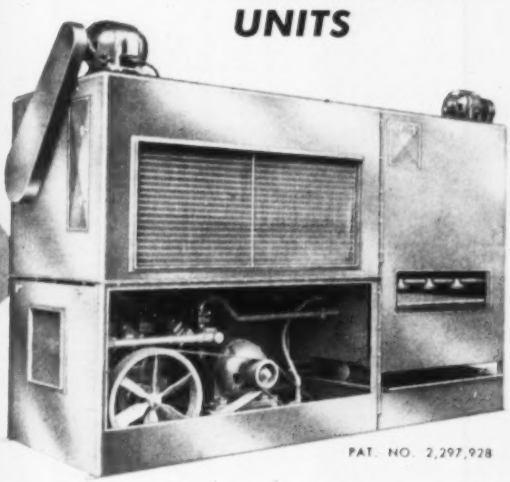

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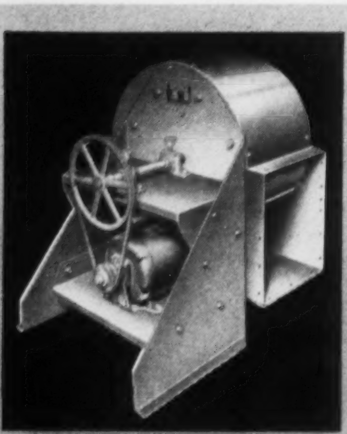
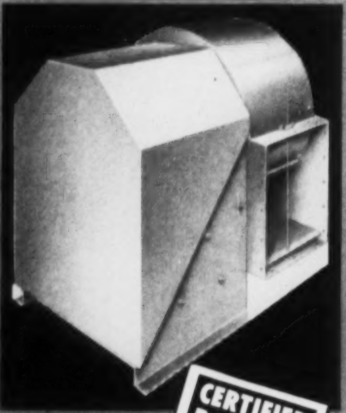


ALADDIN UTILITY SETS



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ALADDIN Utility Sets are available with both forward curved or backwardly inclined blade wheels.

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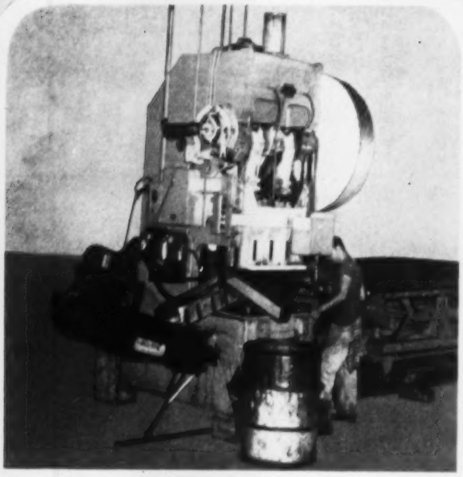

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Random Thoughts from a Filter Engineer

by George F. Parker

- **COMMON DISEASES OF FILTERS**
- **KEEPING FILTERS ON THE JOB**
- **GREASE FILTERS AND U. L. APPROVAL**

COMMON DISEASES OF FILTERS

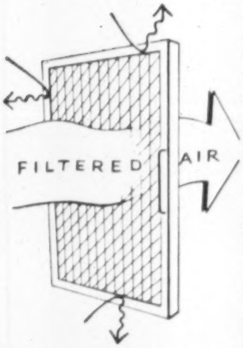
It's unfortunate that the full efficiency and protection built into a filter can't be realized unless the user cooperates. No matter how successful the filter manufacturer is at extending the service period, there still comes a time when some service is necessary. Improper maintenance is the most common disease filters suffer from.

We've tried to analyze why filters aren't treated better. And we think a part of the answer lies in the fact that people can't readily understand that filters will save money if kept clean. On a bearing for instance, it's easy to see the connection between proper maintenance and reduced costs. Improper lubrication reduces efficiency and shortens life. But with an air filter it's different. Filter users don't have to buy air. They figure it's free. And they're not as quick to realize that if filters aren't cleaned, dirty air gets through and that *does* cost money.

We try to make filter maintenance as easy as possible for the user. For example, for those who buy our washable viscous panels, we have available washing tanks, spray nozzles, cleaning compounds, and water-soluble adhesives. Our Automaze and Electromaze filters offer automatic servicing over long periods of time.

Both user and equipment manufacturer alike will insure better air filtration if they will give more recognition to the need of periodic inspection and service of air filters. Even the best filter can't function properly unless it is properly maintained.

KEEPING FILTERS ON THE JOB



Air-Maze Holding Frames and Gaskets Stop By-Pass

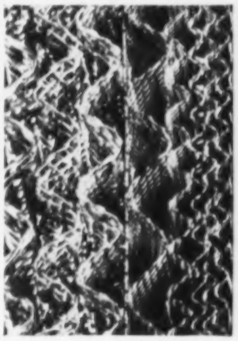
There's one aspect of filter engineering that we seldom get around to talking about—filter accessories. Yet they also need and get the same careful engineering that our filters get.

Take panel holding frames for instance. The four corners are made to present a smooth surface for better sealing. Die-stamped spacer buttons at bottom of the frame insure centering of filter on all four sides. Instead of the usual felt gasket, we furnish one of sponge neoprene that is oil resistant, lasts indefinitely, won't take a permanent set, doesn't support combustion.

To provide even, positive pressure between filter and gasket, we offer a choice of adjustable spring clips, cam-type locking clamps or spring-loaded clamps to fit your particular need or price.

Any one of these features is important in assuring better filter performance. Together, they offer a real plus value that helps to make the difference between Air-Maze and any other filter.

GREASE FILTERS AND U. L. APPROVAL



Cross-Section, Greastop

A clever (?) device used by some manufacturers to infer that their grease filters have U.L. approval goes like this: They secure U.L. approval on a filter used for ventilating air. They then say that "this panel is also designed for use as a grease filter". Voila! The obvious conclusion is that the filter is U.L. approved for grease applications.

Unfortunately, the U.L. has no classification for grease filters. Even our Greastop filter (one of the best), which is made expressly for kitchen range canopy installations, does not carry the Underwriters' label. The Greastop filter is engineered for a specific job. It has heavy galvanized steel wire mesh on the approach face to resist flash grease fires and to stop lint and bulky material without obstructing air flow. The fine wire mesh downstream is specially plated to resist corrosion by the fatty acids in grease.

AFI
MEMBER

Even though Greastop does not carry the U. L. label, we think you'll find, like many thousands of others, that it offers effective protection. The Air-Maze Corporation, 25000 Miles Rd., Cleveland 28, Ohio

AIR-MAZE

The Filter Engineers

AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS

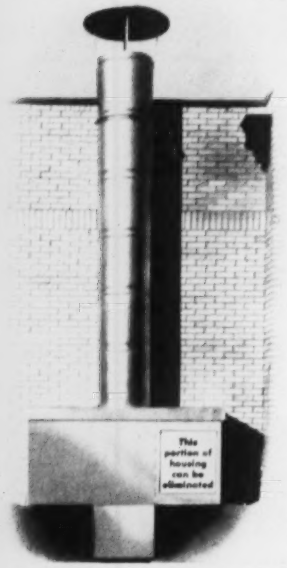
POWER DRAFT

Makes the difference!

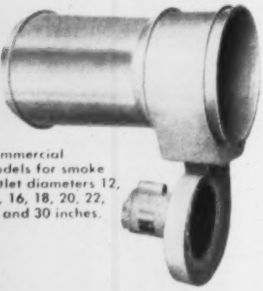
Quickdraft WITH 12-FT. VENT PIPE ELIMINATES 65-FT. CHIMNEY FOR

Bill's Commissary

North Canton, Ohio



POWER DRAFT WITHOUT FANS OR MOTORS IN SMOKE LINE



Commercial models for smoke outlet diameters 12, 14, 16, 18, 20, 22, 24 and 30 inches.

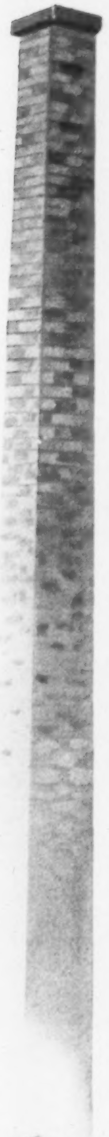
Residential models for smoke outlet diameters 4, 6,7, 8, 9 and 10 inches.

Appearance, efficiency and economy . . . are the advantages Bill's Commissary gained by venting a gas fired steam boiler at roof level with a QUICKDRAFT commercial power draft unit. The unsightly appearance of a 65 ft. chimney towering above a one-story building, was eliminated. For safety and maximum efficiency, gas cannot be turned on in this 2,250,000 Btu boiler until after full draft has been established. In addition, Quickdraft was selected to overcome the 0.1 in. (1/10") negative pressure within the building that could be caused by exhaust fans over ovens and ranges, in event of failure of warm air fans in heat changer. These advantages, unobtainable by gravity draft, were most important on this installation. In addition, power draft venting cost $2,598.00 *LESS* than a 65 ft. chimney.

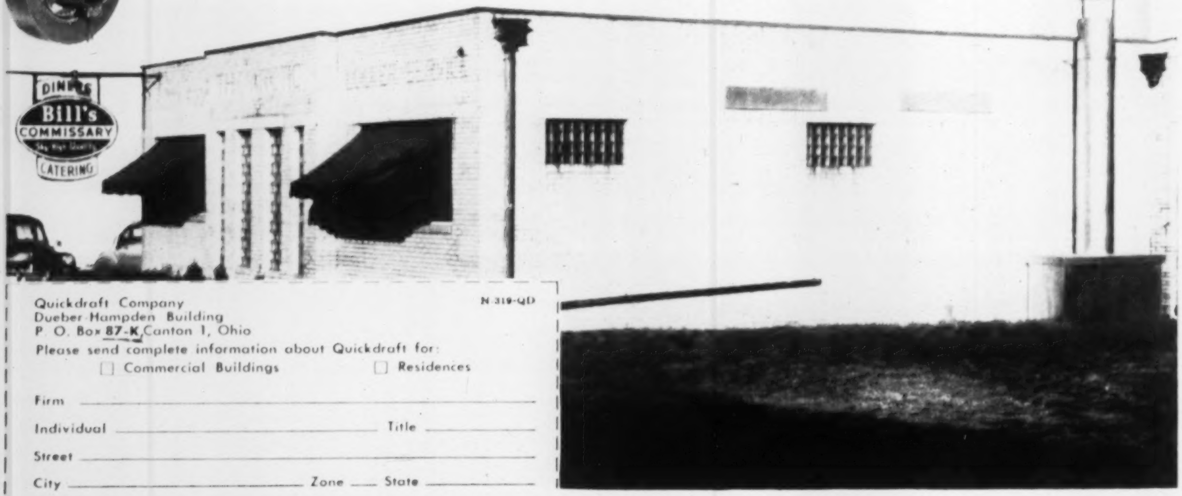
This installation is typical of the advantages Quickdraft offers for residential as well as commercial installations. A standard 22 in. Quickdraft unit was used . . . housing and pipe can be built by local sheet metal contractor. Write for complete details and engineering data.

QUICKDRAFT HAS MANY USES

Venting commercial and residential heating plants . . . *exhausting* noxious and abrasive industrial fumes . . . *with or without a chimney!* Recommendations will be made without obligation upon receipt of rough sketch, notes on fuel used, unit input capacity, size of exhaust outlet, length, height and clear inside area of vent line.



Quickdraft
COMPANY
Dueber-Hampden Building
P. O. Box 87-K
Canton 1, Ohio



Quickdraft Company
Dueber-Hampden Building
P. O. Box 87-K, Canton 1, Ohio

N-319-QD

Please send complete information about Quickdraft for:

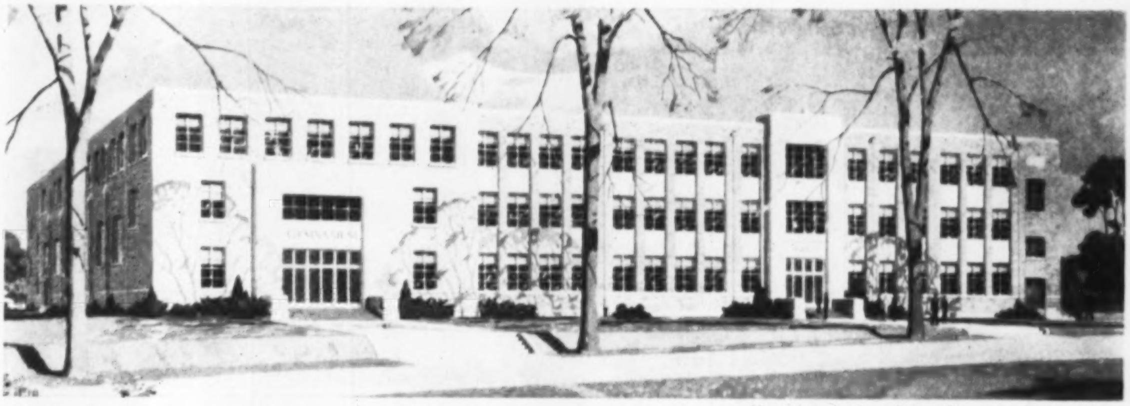
☐ Commercial Buildings ☐ Residences

Firm ____________________

Individual ________________ Title ________

Street ____________________

City ____________ Zone ___ State ________



Mount Assisi Academy, Lemont, Illinois. Leo Strelka, Architect

Now every classroom and office can be comfortable

Iron Fireman SelecTemp heating has

A THERMOSTAT IN EVERY ROOM

The *ultimate* in heating comfort—*a thermostat* in every room—is both simple and practical with the Iron Fireman SelecTemp heating system. Occupants of each classroom or office can select any temperature desired, at any time. Rooms stay at the selected temperatures. SelecTemp units automatically compensate for heat gains and losses caused by changes in outdoor temperature, cold winds and warmth from the sun—increasing or decreasing heat output.

SELECTEMP HIGHLIGHTS

THERMOSTAT IN EVERY ROOM. Temperatures can be varied in every room to fit the "activity plan" and personal preference of the occupants.

MODULATED HEAT. Air circulation is continuous. Both temperature and volume of air are automatically modulated, as required to offset heat loss from room.

FILTERED, CIRCULATED AIR. Individual room air circulation prevents transmission of odors or bacteria from other rooms. Air is cleaned by a spun glass filter in each room unit. Filtered outside air can be introduced if desired.

BOILER LOCATION. Boiler can be placed in any desired location, with proper distribution of heat to every room. Year-around domestic hot water coils available.

LOW POWER COST. No electricity required to operate circulating fans. Nonelectric thermostats.

LOW INITIAL COST. Easily installed in either new or old construction. Small soft copper tubing ($\frac{1}{4}$ inch I.D.) carries steam to individual room heater units. Return lines are $\frac{1}{8}$ inch. Substantial savings in installation costs.

LOW FUEL COST. Temperature easily reduced in unused rooms. Overheating is eliminated. Fuels: Oil, gas or coal. Ideal for use with Central-District steam.

AUTOMATICALLY BALANCED. No special adjustments of dampers, valves or orifices required to balance heating system. Each unit continuously regulates heat needed for each room. Automatically compensates for external heat sources such as fireplace or solar heat, without affecting temperatures of other rooms.

ECONOMICAL INSTALLATION AND OPERATION

Regardless of the type or size of structure; school, office building, hotel or apartment house, hospital, or house . . . SelecTemp heating can be economically and efficiently installed. Flexible copper tubing, smaller than your little finger, carries low pressure steam to each room unit.

In addition to individualized heating comfort SelecTemp brings substantial operating savings. The fuel waste resulting from overheating (symptom: occupants open the windows), and the unnecessary heating of unused space, is eliminated. A fan in each room unit, operated by a steam turbine, continuously circulates filtered warm air. No electricity is used for fans or thermostats.

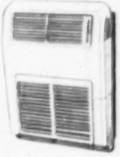
ASK FOR FULL INFORMATION

Before choosing a heating system for any building or residence, whether new construction or being modernized, it will pay you to get the facts about the Iron Fireman SelecTemp—a completely new concept in heating practice. Just mail the coupon or write.

Iron Fireman®

SelecTemp®

MODULATING ZONE HEATING



For every size and type of building—Hotels, Motels, Apartment Houses, Schools, Churches, Office Buildings, Institutions, Hospitals.

Send for free booklet

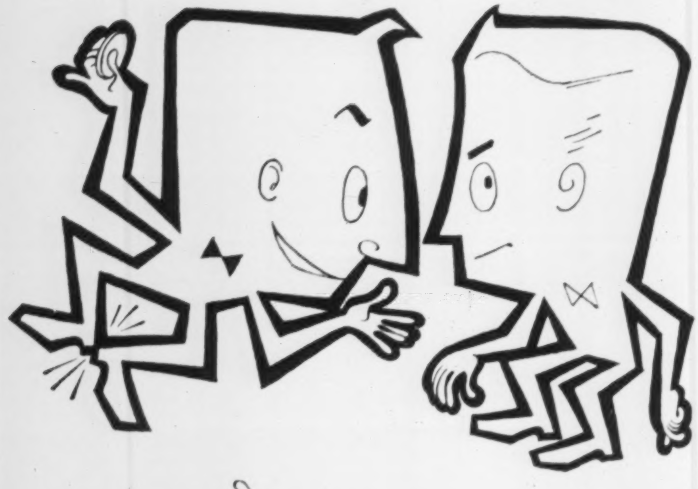
IRON FIREMAN MANUFACTURING CO.
3042 West 106th Street, Cleveland 11, Ohio.
In Canada, write to 80 Ward Street, Toronto, Ontario.

Send literature on Iron Fireman SelecTemp heating

Name

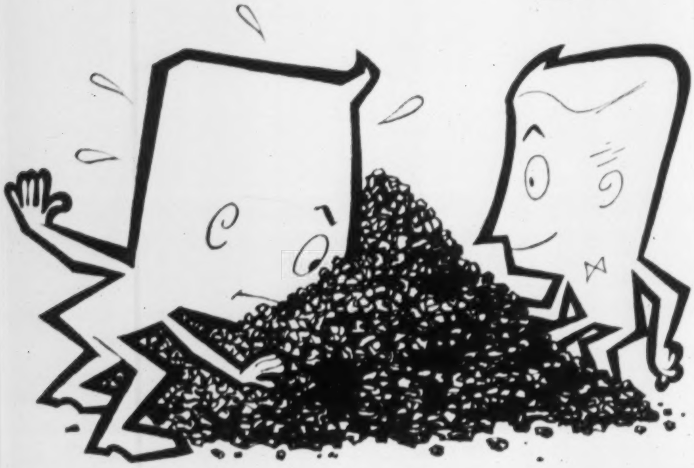
Address

City State



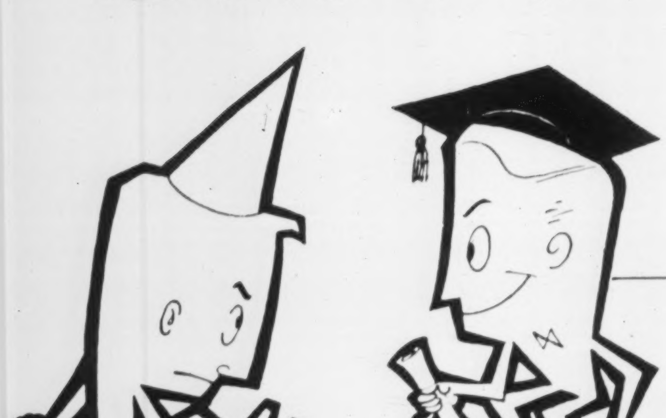
Look! I can buy coal for much less a ton than you're paying.

I used to buy that coal too, but it costs more per million BTU's with a whole lot more in hidden costs.



What do you mean by "hidden costs"?

That coal you're talking about is high in ash. So we were buying ashes at the coal price, paying freight on them from the mine, then paying to have them hauled away. Your "cheaper" coal clinkers; it smokes; it fouls the tubes. That means higher labor costs and higher maintenance. Now I pay more per ton and save thousands of dollars a year.



Coals produced on the C&O are tops in quality.

A C&O combustion engineer showed me why this grade of coal would work best in our type of installation and our experience has shown he was right. You'd better get some expert advice. It can save you money, too.

P.S.

There's a lot more to buying coal than the cost per ton. Why not contact coal producers on the C&O to solve your particular fuel requirements, or write to: R. C. Riedinger, General Coal Traffic Manager, Chesapeake and Ohio Railway Company, Terminal Tower, Cleveland 1, Ohio.

Chesapeake and Ohio Railway

WORLD'S LARGEST CARRIER OF BITUMINOUS COAL

Sam, you better SCRAM!
WATER LINE →

This year's happy hunting ground: those "commercial" jobs

All the experts say the future of business is rosy. But there's always a catch in it: the business may be right there to get, but you've got to go out and get it!

Where? Well . . . the statisticians also tell us that the "commercial" heating market will be up about 18% this year. This means it's the right time to check up on the

Laundries
Dry Cleaners
Bakeries
Bottling Plants
Office Buildings
Police Stations
Fire Houses
Garages
Filling Stations
Churches
Schools
Stores
Hotels
Motels
Apartments
Green Houses
Theatres
Manufacturing Plants

All are right in your back yard, and they should represent your happiest hunting ground in making " '56 the year to fix."

These are *inspected* plants—the kind that must be kept up properly—the kind that are wide open for a lot of new equipment and modernization . . . and not the least of their needs will be McDonnell boiler safety devices.

The ever-growing, ever-improving McDonnell line gives you the quality answer to every need:

—*Water level controls for the low pressure steam boilers.*

—*Water level controls, too, for the hot water heating boilers—today's best and most modern practice.*

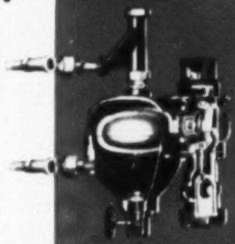
—*Pump controls for the high pressure steam boilers—now available up to 250 psi.*

—*Btu-rated ASME relief valves for hot water space heating boilers, water heaters and tanks—to replace the old un-rated valves.*

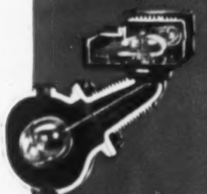
Why not decide to give this market a real prod. Let us supply you with up-to-date data to help it along.

McDonnell & Miller, Inc., 3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One Thing Well

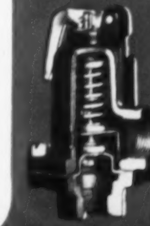


No. 47-2 Quick-Hook-Up Feeder Cut-off Combination for automatically fired steam boilers up to 5000 ft.; maximum steam pressure, 25 lbs. Other types for larger boilers and higher pressure; also for hot water space heating boilers.



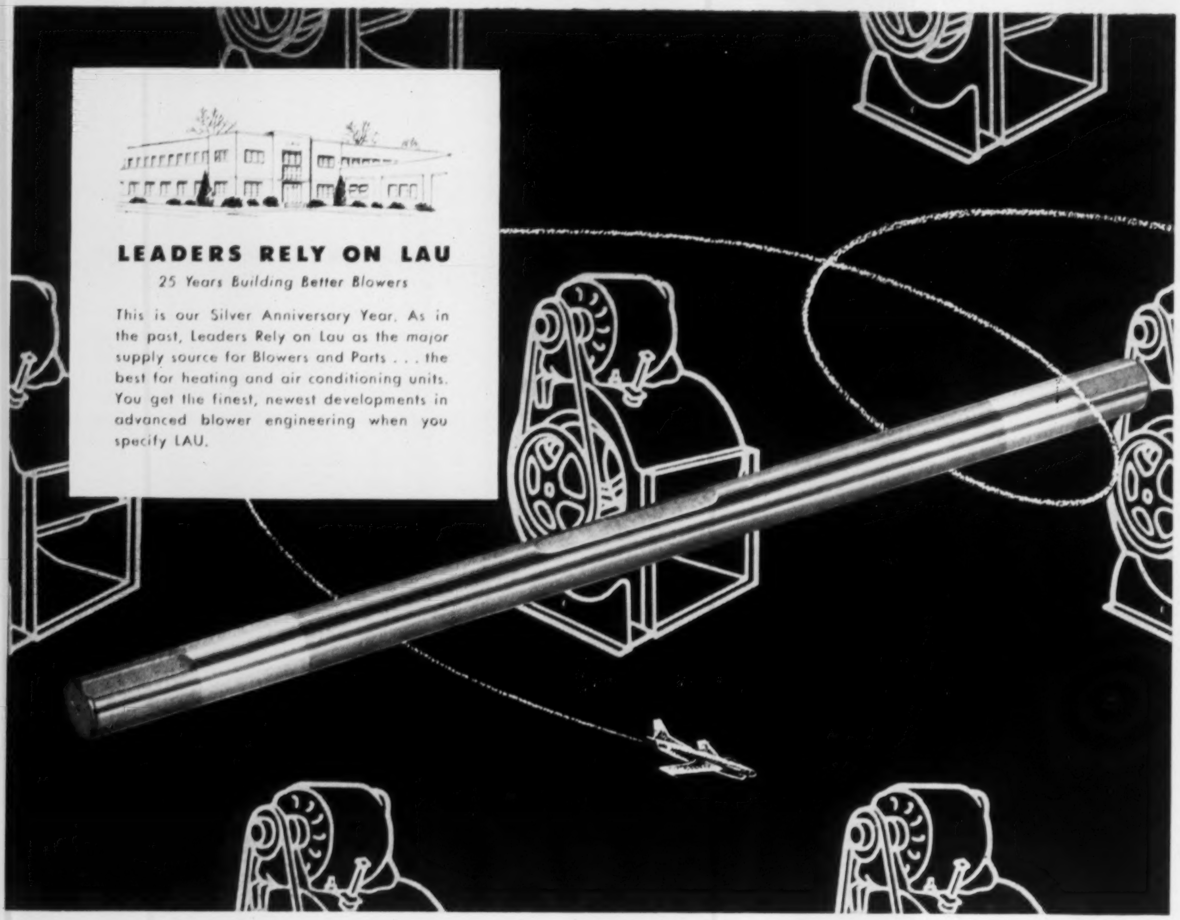
No. 150 Pump Control, Low Water Cut-off and Low Water Alarm for boilers of any size with pressures up to 150 lbs. maximum. 92 series for pressures up to 250 lbs.

No. 67 Low Water Fuel Cut-off for automatically fired steam boilers Maximum pressure, 20 lbs. Other types for hot water space heating boilers.



230 series ASME pressure relief valves for hot water space heating boilers; for hot water tanks and heaters. Tested and Btu-rated by National Board of Boiler and Pressure Vessel Inspectors. Also temperature relief valves and P-T relief valves.

McDONNELL *Boiler Water Level Controls* — *Your Jobber Stocks Them*



LEADERS RELY ON LAU

25 Years Building Better Blowers

This is our Silver Anniversary Year. As in the past, Leaders Rely on Lau as the major supply source for Blowers and Parts . . . the best for heating and air conditioning units. You get the finest, newest developments in advanced blower engineering when you specify LAU.

FIT FOR A FLIGHT

The exclusive Lau-designed and manufactured shaft has an *aircraft quality* finish in the journal area. Actually our two-pass centerless grinding and high-pressure burnishing of these shafts gives them a finish superior to that of some aircraft parts. This shaft, used in all Lau belt driven blowers, is built to very close dimensional tolerances for exceptionally long life, exact fit, quieter operation and maximum efficiency; permitting the use of finer lubricants. Uniform flat control is obtained by the simultaneous automatic milling of all three flats at one time. Our quality-engineered shaft is but one of the many unseen features that make Lau Blowers outstanding in performance and economy. What's your air-moving problem? Write Lau today, Dept. M.

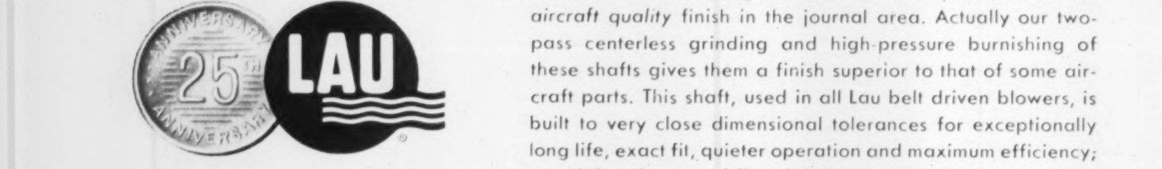
ANNIVERSARY 25TH ANNIVERSARY LAU®

THE LAU BLOWER COMPANY

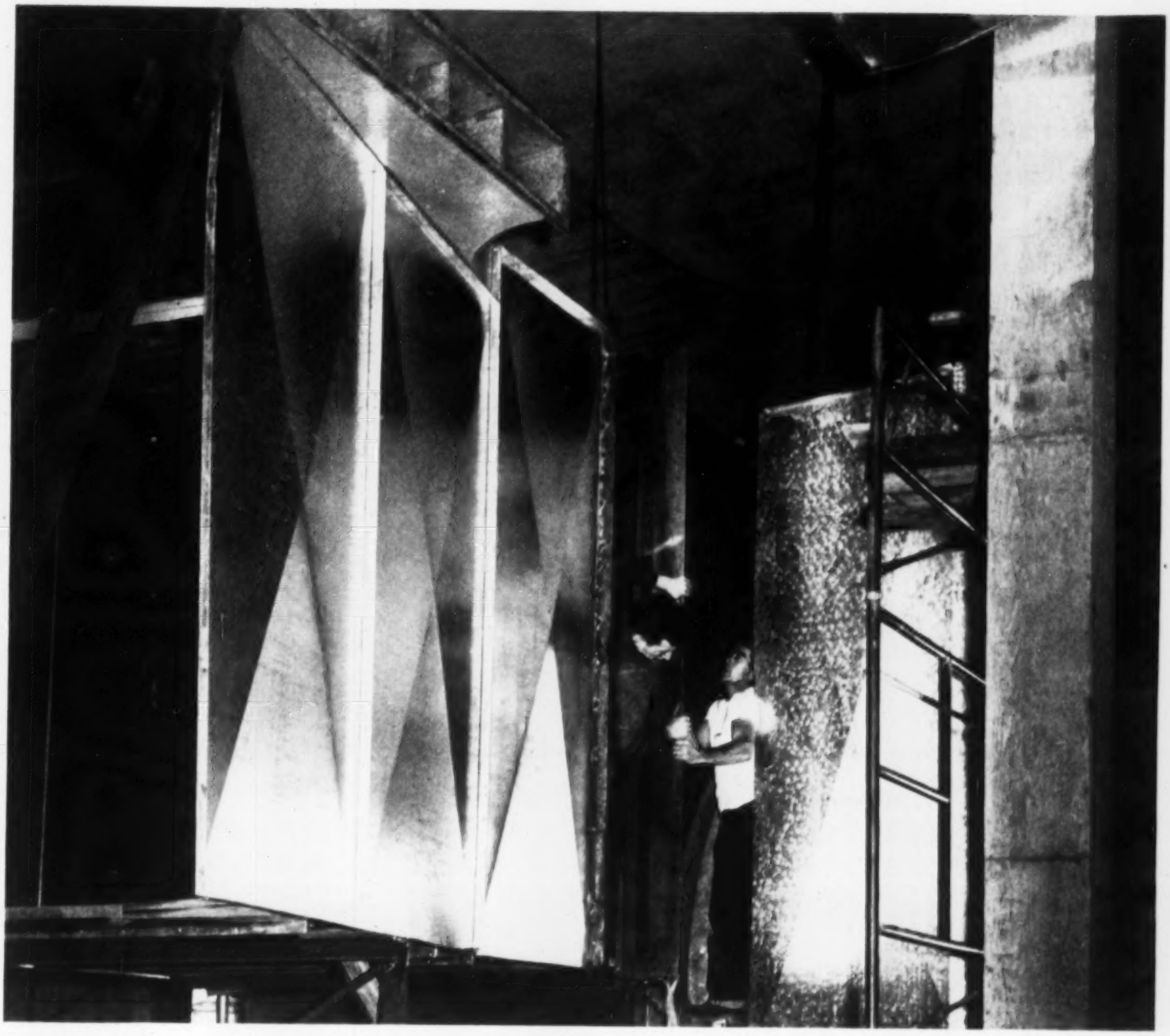
2000 Home Ave. • DAYTON 7, OHIO

Other plants at Kitchener, Ont., Canada, and Azusa, California

LB 2, 56



WORLD'S LARGEST MANUFACTURERS OF AIR-CONDITIONING BLOWERS



Bethcon is better to work, better to look at

Sheet-metal jobs like this one are being made better these days with Bethcon, product of Bethlehem's continuous galvanizing lines. One of the chief advantages of continuous galvanizing is the superior bond between zinc coating and base metal, which permits severe forming without damage to the galvanized finish. You can actually bend Bethcon double without cracking or peeling of the zinc.

Another "plus" is the improved appearance and sales appeal of the finished product. Continuous galvanizing gives Bethcon brighter, more uniform spangles. It also distributes the zinc more evenly over the sheet, eliminating the heavy beads usually found on the drip ends of galvanized sheets.

You can specify Bethcon in cut sheets or coiled lengths, 16-gage or lighter. You can also choose between plain and corrosion-resisting copper-bearing steel for the base metal, depending on your requirements. Any additional information you would like to have about Bethcon will be gladly furnished by the Bethlehem sales office nearest you.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Fast, easy to apply, Armaflex can be slit lengthwise, snapped in place, and sealed with adhesive on lines already in operation. If applied at the same time as the piping, it can be slipped over the pipe or tubing and readily follows bends with no cutting.

New insulation for liquid heating and cooling lines

goes on fast—in one operation

Armstrong Armaflex* is a new, flexible plastic insulation for commercial and residential air-conditioning and heating lines. Installation is fast, clean, and easy. On cold lines, no separate vapor barrier need be applied, because the closed cellular composition of Armaflex is a positive seal. The only application sundry used is Armstrong 520 Adhesive for cementing joints. Armaflex will not rub off, chip, or crumble, and waste is negligible.

A highly efficient insulation, with a K factor of .28 at 75 F., ½″ thick Armaflex will prevent condensation under normal design conditions on indoor lines operating as low as 32 F. On the heating cycle, it will withstand 200 temperatures.

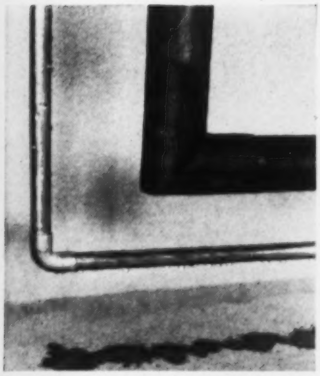
Armstrong Armaflex pipe insulation is made in 6′ lengths for copper tubing and iron pipe 3/8″ to 3⅛″ ID. Thicknesses of ½″ and 3/8″ are available.

For free booklet containing complete data on this remarkable new insulation, call your nearest Armstrong office or write today to Armstrong Cork Company, 2003 Sherman St., Lancaster, Pa.

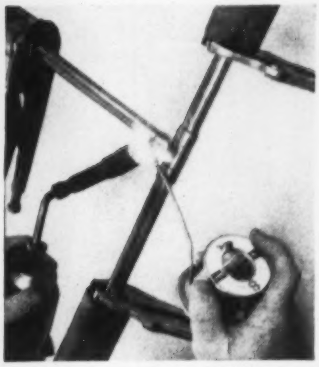
*TRADE MARK

Armstrong

INDUSTRIAL INSULATIONS



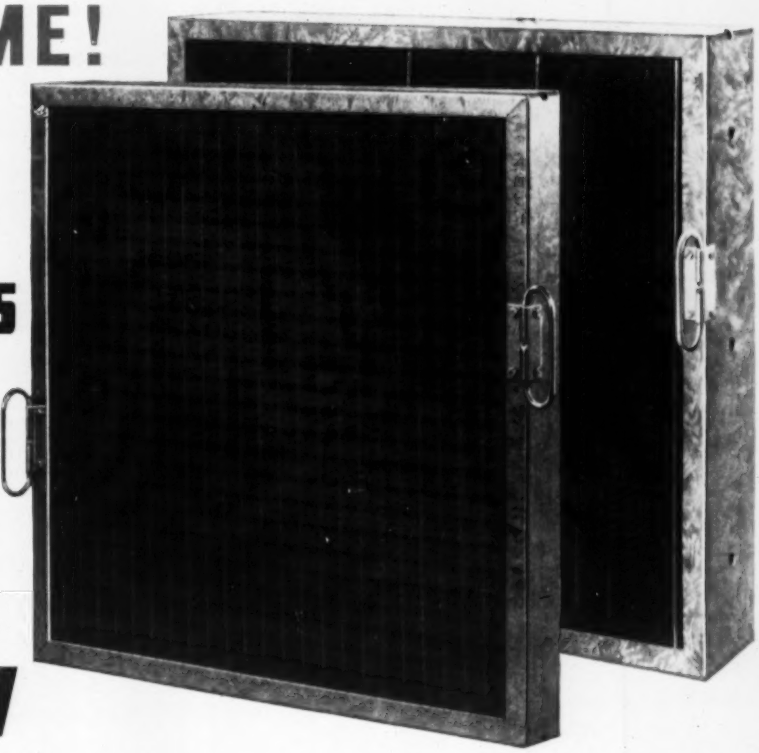
Condensation is stopped by closed cell structure and high insulation efficiency under normal design conditions on indoor lines operating as low as 32 F.



A self-extinguishing material, new Armaflex will not support combustion and may be slipped in place over copper tubing before sweat fittings are made.

Rapid fabrication of fitting covers is accomplished by miter-cutting pieces of Armaflex and cementing them together with Armstrong 520 Adhesive.

WORTHY of the FAMILY NAME!



AIR
CONTINENTAL
FILTERS

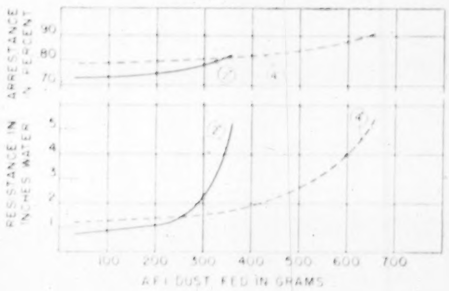
CONTINENTAL'S

New

TYPE LV

AIR FILTERS 2 AND 4 INCHES THICK

These new viscous impingement filters of the "screen wire" type offer efficient cleaning throughout a long service-life at low initial cost. Heavy galvanized finish on the crimped wire cloth of the media, and on the heavy steel-channel frame assures high resistance to rust and corrosion. Several layers of expanded metal in the 4-inch models add considerably to the large dust-holding capacity of the Type LV. Available in standard sizes, either thickness; holding frames to match, or will fit most standard frame installations; handles optional.

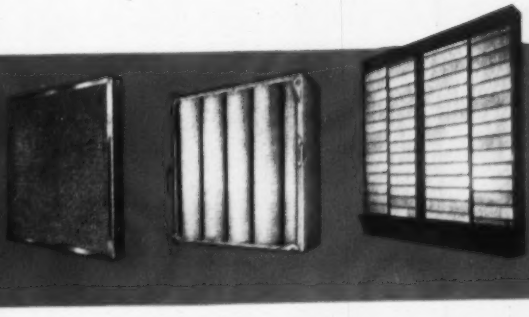


Check with your local CONTINENTAL representative or write:

AIR
CONTINENTAL
FILTERS

P.O. BOX 1647 LOUISVILLE 1, KY.

CONTINENTAL
AIR FILTERS Inc.



conceal it or hang it . . . at ceiling level!

AMERICAN-Standard Horizontal Remotaire

is the space-saving way to year 'round air conditioning

. . . provides economical heating-cooling

. . . makes best use of available space

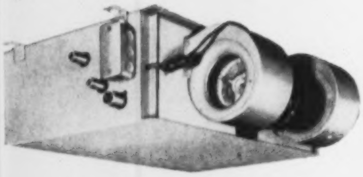
- You can hang Horizontal Remotaire Units on the ceiling—between rooms, in closets, above false ceilings. Similar to the famous Remotaire floor models, these compact horizontal units heat, cool, filter and recirculate *all* the room air. Three models solve every installation problem. Four sizes—200, 300, 400 and 600 cfm capacities—meet every room need.

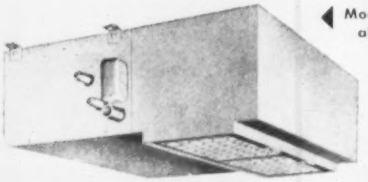
Horizontal Remotaires are only 8½" to 10¾" high . . . require minimum headroom for reduced installation costs. These units are equipped with extended winding motors for low current consumption and have sealed-in oil supply for dependable operation and absolute minimum maintenance.

Like all Remotaire units, this new model operates with heated or chilled water supplied from a central plant through a simple, compact piping system. The new Horizontal Remotaire unit can readily be used in new construction and is especially suitable for remodeling. It allows you to install the unit in almost any available space, and often permits the use of your original piping system.

For more information on this unit, or on the complete line of American-Standard Remotaire Heating-Cooling Systems, just write to AMERICAN-STANDARD PLUMBING AND HEATING DIVISION, P. O. Box 1226, Pittsburgh 30, Pennsylvania.

Model H—ideal for use in a hallway.





Model HB — especially suitable for closet installation.

Model HR — best to use free-hanging from a ceiling . . . can be concealed.

AMERICAN-Standard

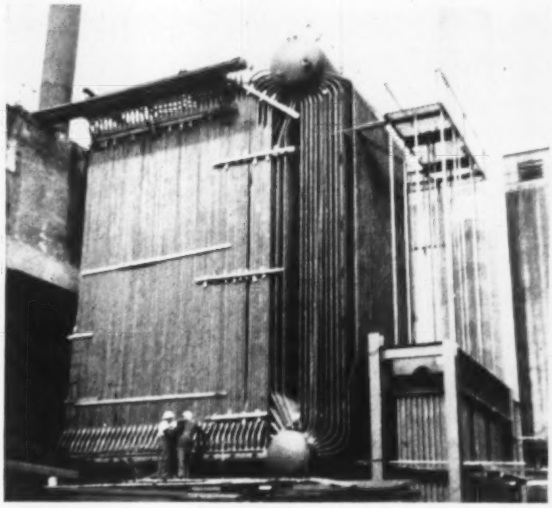
WATER HEATING-COOLING SYSTEMS

POST STREET
STEAM PLANT
4000 H. P.

GILSULATE®—
The End of A Search

Old Post St. plant has 4,000 HP boiler capacity. Steam lines were originally encased in red cedarwood log conduits.

New Riley Boiler of Seattle Steam Corp. at their Western Ave. plant has 266,000 pounds per hour peak load; is set in weatherproof casing.

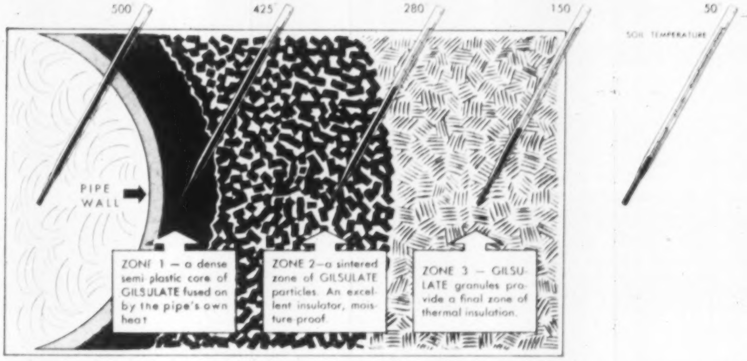


For more than half of a century, District Heating Companies have been seeking a way to prevent corrosion and reduce heat loss from underground steam mains. Many materials and techniques have been tried—unsuccessfully—spurred on by rising fuel prices and pipe replacement costs.

In 1952, Seattle Steam Corporation tried their first GILSULATE installation. So far, they have observed *complete corrosion protection and excellent insulating properties*. Is GILSULATE the end of the search?

Today this 18th largest of all American District Heating Companies orders GILSULATE in carload lots and maintains warehouse stocks for use on new lines, extensions and where a ditch is opened and existing facilities are exposed.

Investigate the values of this easily-installed, low-cost insulation yourself. Use the coupon below for complete information or write for the name of your nearest GILSULATE distributor.


500°
425°
280°
150°
50°
SOIL TEMPERATURE
PIPE WALL
ZONE 1 — a dense semi-plastic core of GILSULATE fused on by the pipe's own heat
ZONE 2—a sintered zone of GILSULATE particles. An excellent insulator, moisture-proof.
ZONE 3 — GILSULATE granules provide a final zone of thermal insulation.

Facts about Gilsulate

1. *Easy to use* just pour, tamp and backfill... pipe heat does the rest.
2. *Forms 3 zones* of protection against heat loss and all hazards commonly encountered by hot buried pipes.
3. *Needs no housing or mechanical sheaths:* no mixing, special handling or equipment.
4. *Only needs normal pipe spacing:* for multiple pipe or cramped conditions.
5. *Three types available:*
   - Type A for 220°-310° F. temp. range
   - Type B for 300°-385° F. temp. range
   - Type C for 385°-520° F. temp. range

THE TRIPLE-ZONE INSULATION FOR LIFETIME PROTECTION OF HOT UNDERGROUND PIPES

GILSULATE®

AMERICAN GILSONITE COMPANY, SALT LAKE CITY 1, UTAH
Affiliate of Barber Oil Corp. & Standard Oil Co. of California

American Gilsonite Co.
134-B West Broadway, Salt Lake City 1, Utah
or
1145 East Jersey St., Elizabeth, N. J.

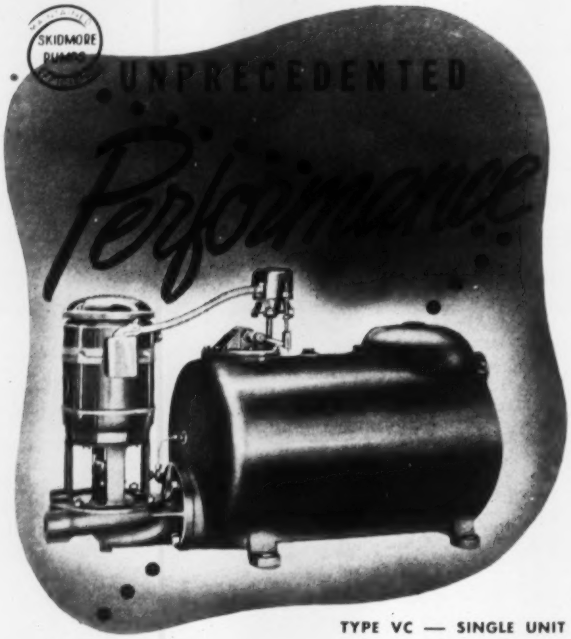
Send me more information on GILSULATE Insulation

NAME
TITLE
COMPANY
ADDRESS
HPA

ELIMINATE YOUR HEATING PUMP PROBLEMS—FOR GOOD!

call in a Skidmore Specialist

There's no need for heating engineers, architects or contractors to worry these days — they know the record of performance and continuous service of Skidmore Pumps throughout the years — they know that from this one source (The Skidmore Heating Pump Specialist) you can get experienced council on every type of pump installation. Tailored to your specific needs — you eliminate your pump problems "for good". There's a Skidmore Specialist in every principal city — call him today!



TYPE VC — SINGLE UNIT

The Skidmore Type VC Condensation Pump and Receiver has low inlet connection . . . operates quietly . . . impeller is bronze centrifugal enclosed type. Especially designed for handling hot condensate, entire unit can be removed for inspection or repair without disturbing piping connections. Skidmore Pumps are furnished in either single or duplex type according to installation requirements.

For complete information write for SKIDMORE VC Bulletin No. 10-B.

TYPE "UV"

Where returns are too low to premit the operation of horizontal type pumps — the Skidmore UV Pump performs very satisfactorily. Consists of vertical pump and motor unit with float and float switch mechanism mounted on sump type receiver unit. Write for Bulletin No. 19-B.

SKIDMORE PUMPS

SKIDMORE CORPORATION ST. JOSEPH, MICHIGAN

you specify
with
Confidence
when you choose

Airtemp
air conditioning

Plan for AIRTEMP Air Conditioning—it's virtually trouble-free!

No "bugs" to be worked out—*you're sure of perfect performance always* because every AIRTEMP job is backed by 21 years of advanced engineering by *Chrysler*. Whether your needs are large or small, the complete AIRTEMP line will meet your every requirement.

In determining the *one best* system for any building, in planning the layout and in the actual installation . . . you can count on expert guidance from top engineers of Airtemp Construction Corporation. And to *guarantee* your installations during the years to come, the nation-wide network of AIRTEMP personnel provides dependable service in every major community.

As the years go by, your clients will have tangible evidence of your wisdom in specifying AIRTEMP. They will appreciate particularly the low operating costs that result from modern, efficient design.

For full information on how AIRTEMP can meet all of *your* air conditioning needs, write: Airtemp Construction Corp., Dayton 1, Ohio.

AIRTEMP BUILDS AIR CONDITIONING TO FIT EVERY REQUIREMENT

THE *FORWARD* LOOK IN AIR CONDITIONING

A FEW AIRTEMP DREAMS THAT BECAME REALITIES!

Union Pacific Building
Omaha, Nebr. Architect: Davis Hunt, Chicago; Engineers: Ritter & Mott, Chicago; Contractors: James Stewart & Co.

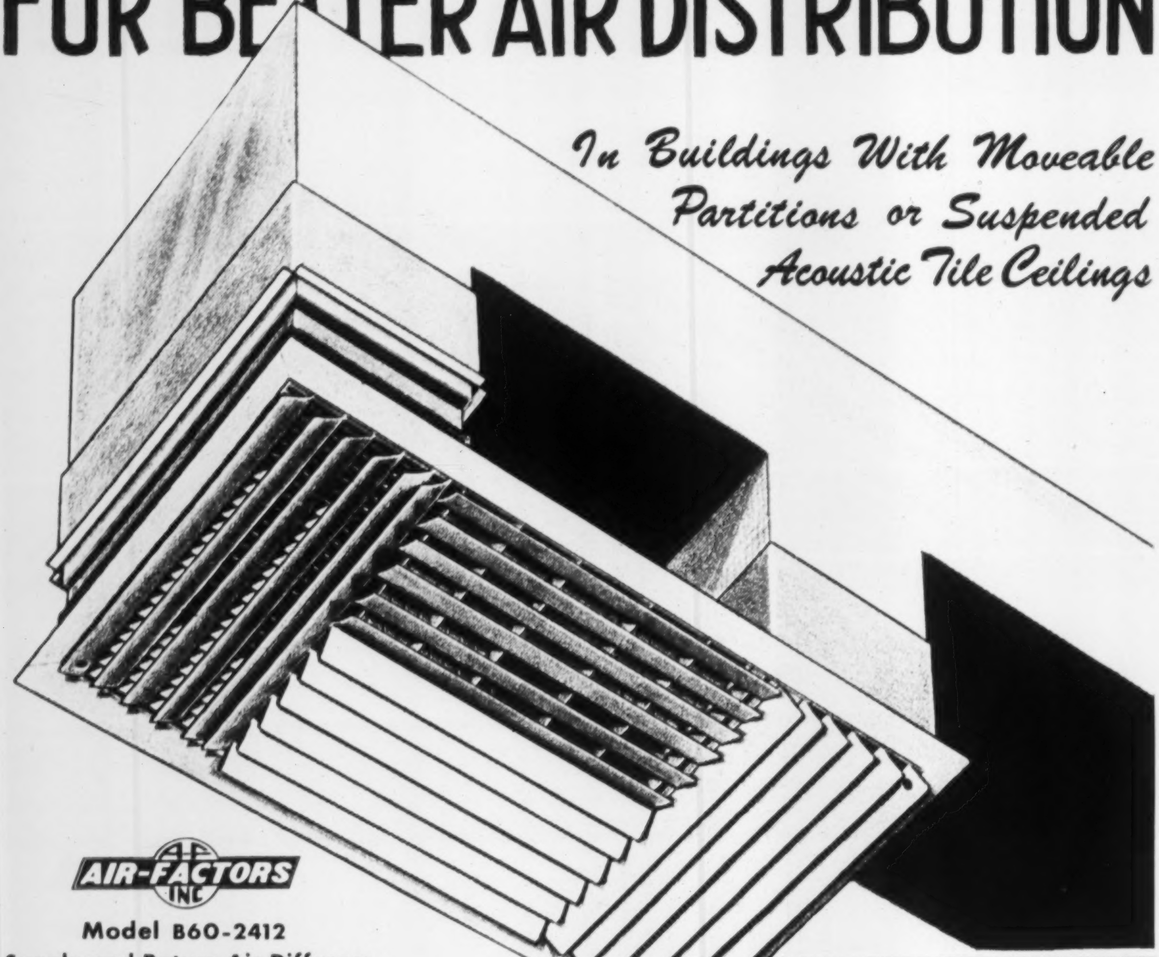
Magnolia Building
Dallas, Texas. Air conditioned in 1938. Architects and Engineers: Lang & Weichel.

Airtemp
CONSTRUCTION CORPORATION
SUBSIDIARY OF CHRYSLER CORP.

AIR CONDITIONING • HEATING FOR HOMES, BUSINESS, INDUSTRY

FOR BETTER AIR DISTRIBUTION

In Buildings With Moveable Partitions or Suspended Acoustic Tile Ceilings



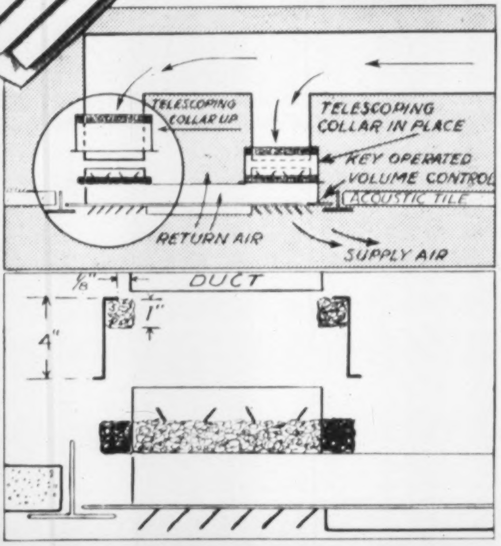
AIR-FACTORS INC

Model B60-2412
Supply and Return Air Diffusers

One Air Diffuser For All Installations

IN THE SPACE OF ONE 24" x 12" CEILING TILE, AIR-FACTORS MODEL B60-2412 WILL:

- Diffuse 50-225 cfm in a 2 Way pattern
- Diffuse 50-300 cfm in a 3 Way pattern
- Diffuse 50-450 cfm in a 4 Way pattern
- Install easily with its telescoping duct collar
- Permit Air Diffuser Area changes after installation
- Balance with opposed acting volume controls

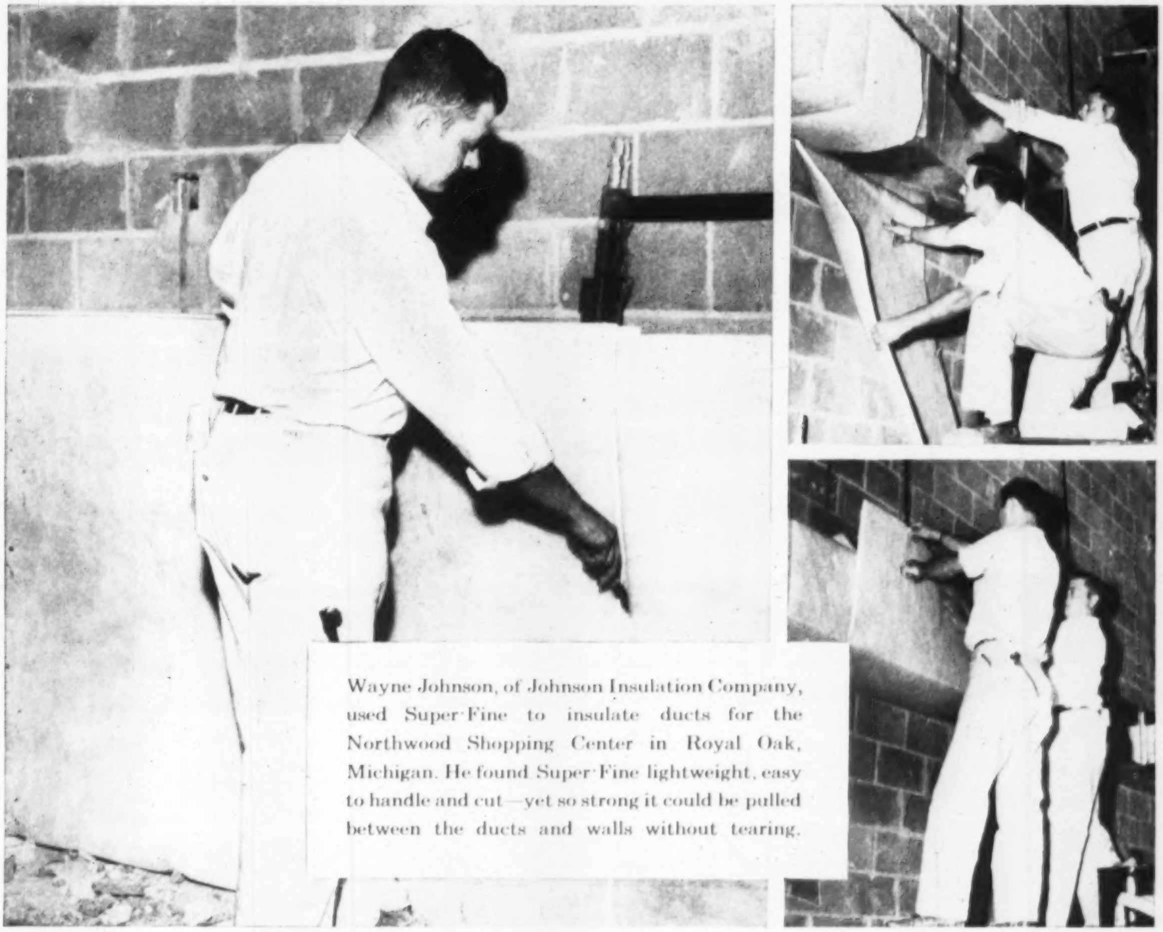

TELESCOPING COLLAR UP
TELESCOPING COLLAR IN PLACE
KEY OPERATED VOLUME CONTROL
ACOUSTIC TILE
RETURN AIR
SUPPLY AIR
1/8"
DUCT
1"
4"

Write for information

AIR-FACTORS INC 1624 South Raymond Ave. Monrovia, California

MANUFACTURERS OF THE MOST COMPLETE LINE OF AIR DISTRIBUTION EQUIPMENT

INSULATION news from L·O·F GLASS FIBERS COMPANY



Wayne Johnson, of Johnson Insulation Company, used Super·Fine to insulate ducts for the Northwood Shopping Center in Royal Oak, Michigan. He found Super·Fine lightweight, easy to handle and cut—yet so strong it could be pulled between the ducts and walls without tearing.

Super·Fine's low installation cost means big business for contractors!

Fast installation combined with high insulating efficiency can clinch the contract for you.

Super·Fine's millions of fine glass fibers form countless dead air cells which provide highly efficient insulation. It is pleasant to handle fast and easy to apply. It cuts readily with an ordinary knife, needs no special measuring or fitting, can quickly be wrapped around ducts and supporting hangers. Contractors find that workmen can apply more Super·Fine per day than other types of insulation.

You save on storage space, too, because Super·Fine comes in compressed rolls up to 72" wide, in all standard thicknesses and roll lengths. They take up less space, yet the insulation springs back to full thickness when unrolled.

There's big business ahead for you when you discover how Super·Fine can help you save on duct-application costs. Check your Yellow Pages for the nearest distributor or write: L·O·F Glass Fibers Company, Dept. 39-36, 1810 Madison Avenue, Toledo 1, Ohio.

LOF GLASS FIBERS
SUPER·FINE
INSULATION

L·O·F GLASS FIBERS COMPANY

TOLEDO 1, OHIO

Makers of glass fibers by the exclusive "Electronic-Extrusion" process

THE MARK OF QUALITY

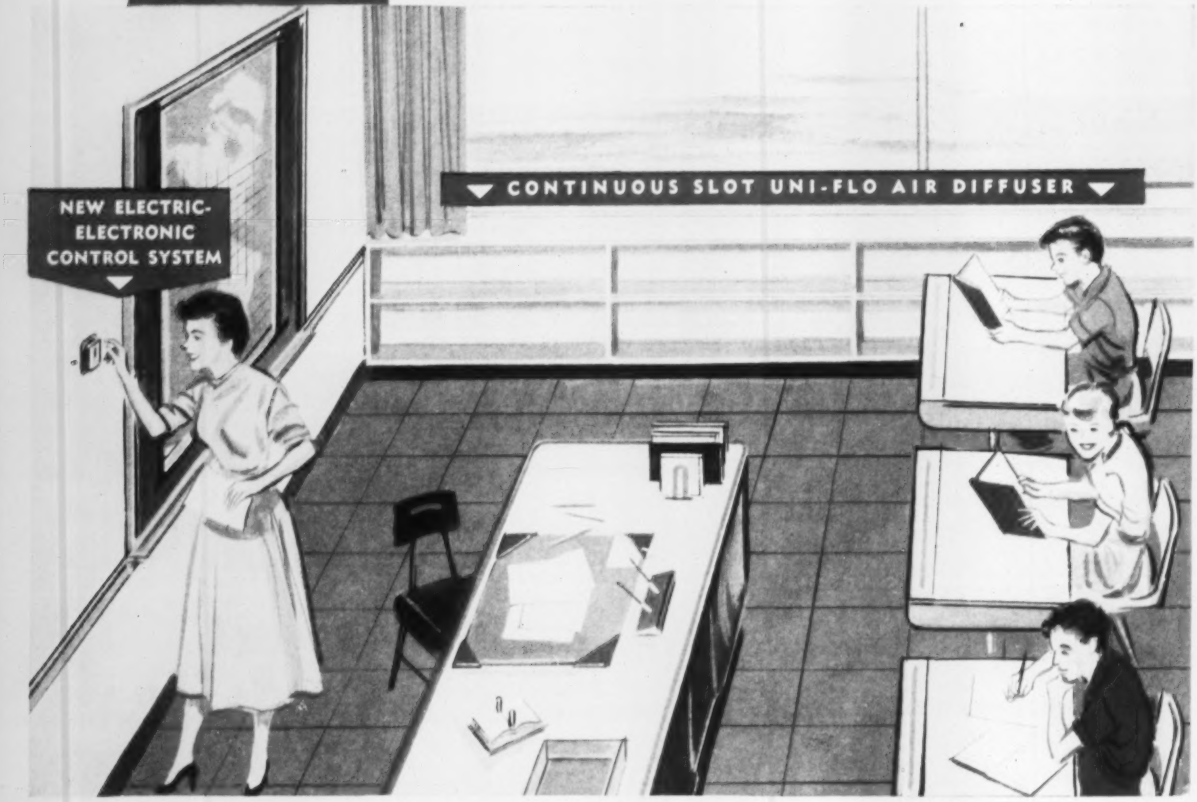
BARBER
COLMAN

UNI-FLO
ENGINEERED AIR
DISTRIBUTION

ELECTRIC-ELECTRONIC
Automatic
Controls

Developed at Wildwood Elementary School, West Allis, Wisconsin . . .

Important new answer to individual room comfort in modern daylight schools!


CONTINUOUS SLOT UNI-FLO AIR DIFFUSER
NEW ELECTRIC-ELECTRONIC CONTROL SYSTEM

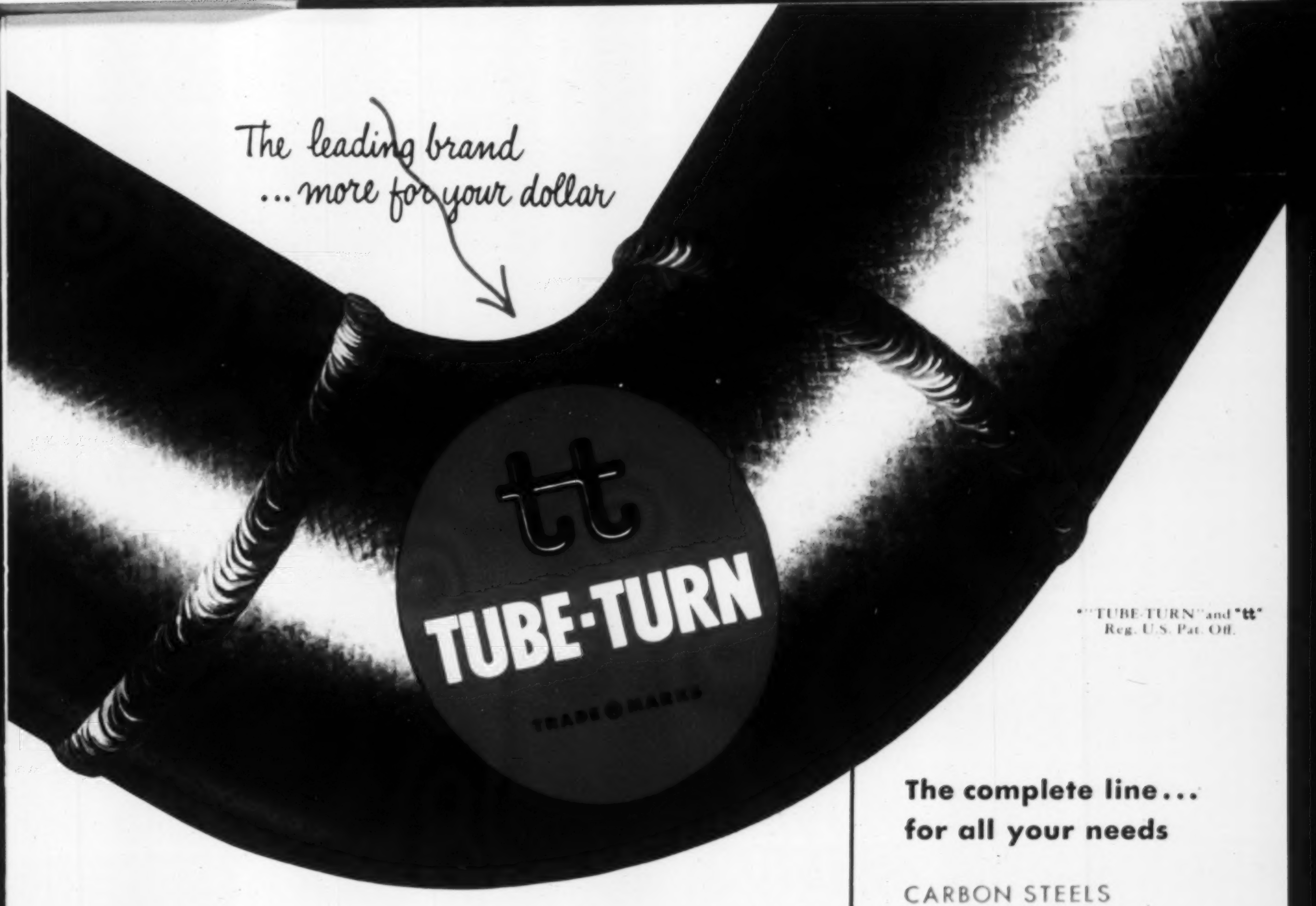
Learn the complete story! Find out how Barber-Colman engineers with background in both air distribution and temperature control combined skills with the consulting engineer and architect.* The resulting new indoor comfort system is applicable to buildings all over the country having extensive window areas . . . it may be exactly the answer you've been searching for. Phone your nearby Barber-Colman Office or write today!

* HOLLAND & BESEKE, *Consulting Engineers;* LINDL-SCHUTTE & ASSOCIATES, *Architects and Engineers,* West Allis, Wisconsin.

Come to ONE source . . .
come to . . .

Barber-Colman Company

DEPT. C, 1601 ROCK ST., ROCKFORD, ILLINOIS, U. S. A.



*"TUBE-TURN" and "tt"
Reg. U.S. Pat. Off.

To help you in the fight on corrosion...

FIBRES of inert iron silicate distributed throughout high-purity iron make wrought iron *tough* and *corrosion-resistant*... hence a desirable piping material for many applications where corrosion is a factor. In this material too, the "TUBE-TURN"* line of welding fittings is *complete* . . . all types, sizes and schedules for every job in wrought iron piping.

Here is another reason it pays to specify this leading brand! You get exactly what you need from more than 4000 items in all piping materials . . . available *promptly* from your nearby Tube Turns' Distributor. He can save you purchasing time and delivery time, and give you more for the dollar with TUBE-TURN Welding Fittings and Flanges.

TUBE-TURN Welding Fittings and Flanges are made in U. S. A.
They meet *all* U. S. piping code specifications.

TUBE TURNS LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Detroit • Chicago • Kansas City • Denver
Los Angeles • San Francisco • Seattle • Atlanta • Tulsa • Houston • Dallas • Midland, Texas

**The complete line...
for all your needs**

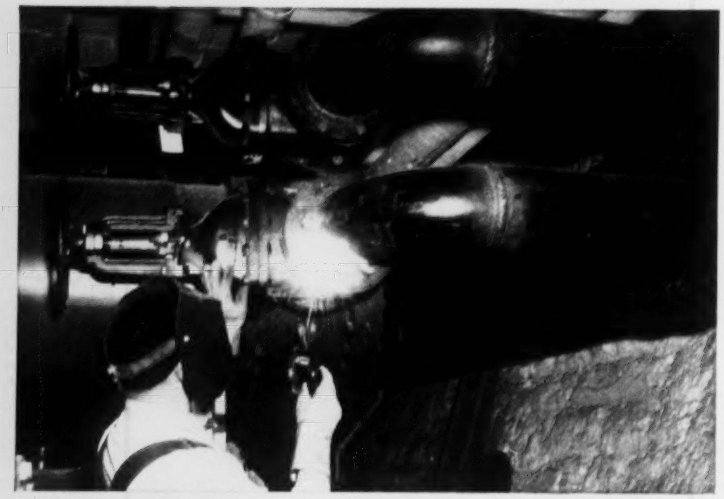
- CARBON STEELS
- STAINLESS STEEL
- CHROME-MOLY STEELS
- **WROUGHT IRON**
- ALUMINUM
- COPPER
- BRASS
- MONEL METAL
- INCONEL
- NICKEL

Available from your nearby TUBE TURNS' Distributor

APPLICATIONS

TUBE TURNS' *Engineering Service*

helps you apply wrought iron fittings on jobs like these...



Air Conditioning piping . . . wrought iron and TUBE-TURN* Welding Fittings are used for condenser water lines shown here, part of new air conditioning installation at State Capitol Building, Harrisburg, Pennsylvania. Contractors: Riggs Distler & Co., Inc.

Down Spouts on Abbey Avenue Bridge, Cleveland. Made of 10" wrought iron pipe, with 45° TUBE-TURN Wrought Iron Elbows. Contractor: Gorman-Lavelle Co., Cleveland.

Hospital piping . . . wrought iron 5" cold water; 2½" high-pressure condensate returns and 4" pump discharge . . . at City Hospital, Cleveland. TUBE-TURN Wrought Iron Fittings used throughout.

Radiant Heating. Many engineers prefer wrought iron piping for these systems (and snow-removal systems). Shown here: welding in bank of coils to hot water line with TUBE-TURN Welding Tee at Capitol Annex Building, Frankfort, Kentucky. Contractor: B. A. Walterman Co., Cincinnati.

All-around Service. Your nearby Tube Turns' distributor will see that your needs in fittings (of all materials, types and sizes) are met promptly. He will also see that you get Tube Turns' engineering service on your piping applications.

WROUGHT IRON
FITTINGS
AVAILABLE FROM
YOUR NEARBY
TUBE TURNS'
DISTRIBUTOR

90° ELBOWS

45° ELBOWS

180° RETURNS

TEES

CAPS

CONCENTRIC
REDUCERS

ECCENTRIC
REDUCERS

FLANGES

APPLICATION DATA
for use of TUBE-TURN Wrought Iron Welding Fittings...

TUBE TURNS, Dept. A-1
224 East Broadway, Louisville 1, Kentucky
Please send Bulletin TT-787 on Wrought Iron Fittings.

Company Name
Company Address
City *Zone* *State*
Your Name
Your Position

tt
TUBE-TURN
WROUGHT IRON

*"TUBE-TURN" and "**tt**" Reg. U.S. Pat. Off.

TUBE TURNS

A DIVISION OF NATIONAL CYLINDER GAS COMPANY
LOUISVILLE 1, KENTUCKY

DISTRICT OFFICES: New York · Philadelphia · Pittsburgh
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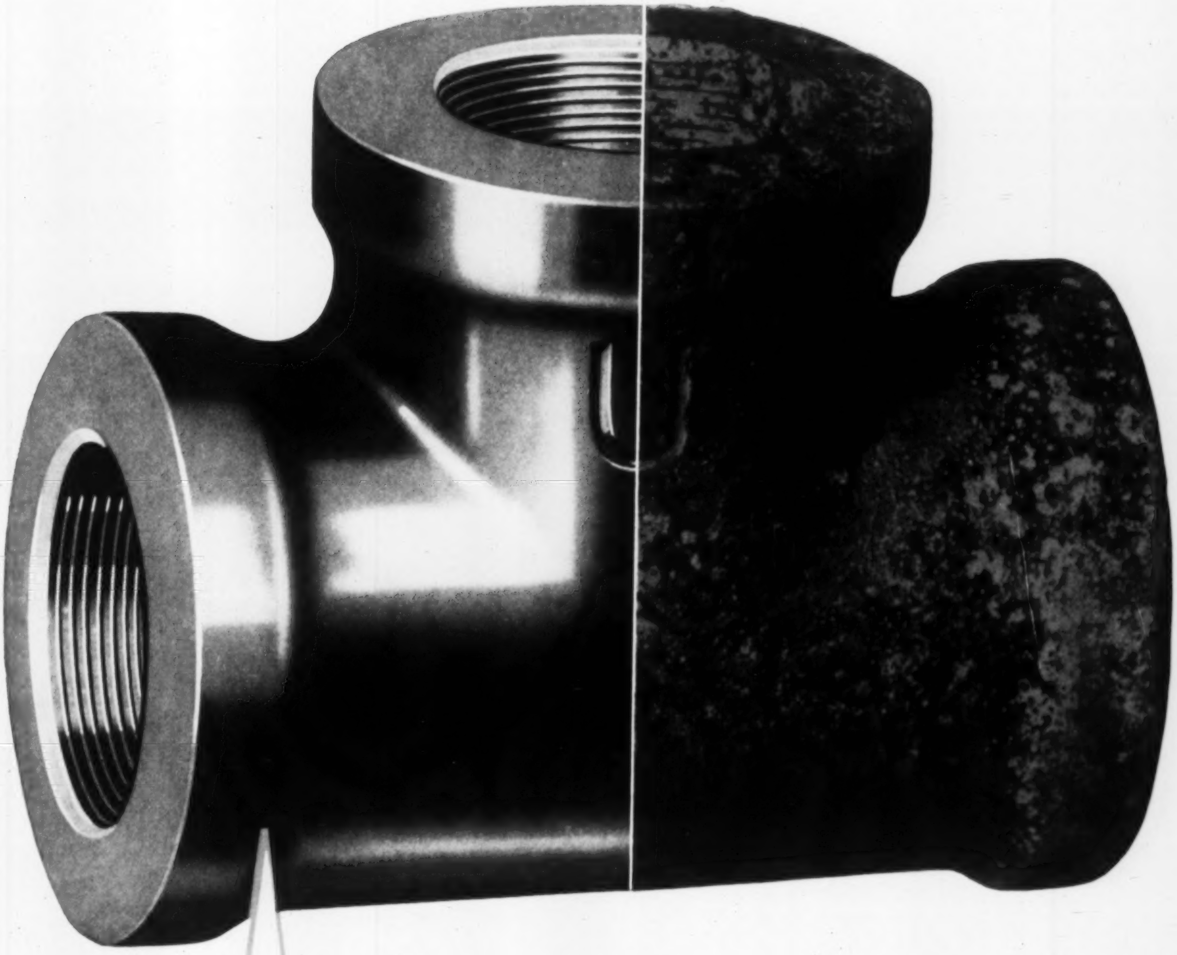


U-COTE FITTINGS

RESIST RUST AND CORROSION

AT NO EXTRA COST—you can buy black malleable fittings protected by U-Cote, an exclusive Union Malleable protective coating. U-Coted fittings have been subjected to laboratory tests many times more severe than normal usage—and it's a proven fact that U-Coted fittings will protect you against rust and corrosion loss. For home, business and industrial use, U-Cote deserves first consideration.

A COMPLETE LINE OF FITTINGS DISTRIBUTED THROUGH WHOLESALERS ALL OVER THE WORLD

The UNION MALLEABLE MFG. CO.
ASHLAND, OHIO U. S. A.

from "Chicago"

A SPECIFIC TYPE OF PUMP

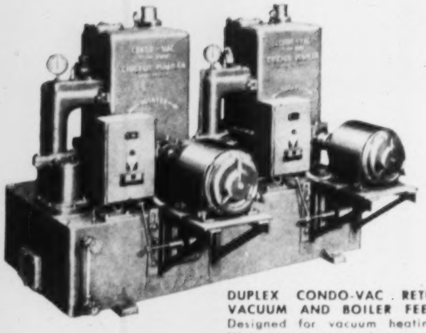
for every Steam Heating System

IN
CHICAGO PUMP CO.

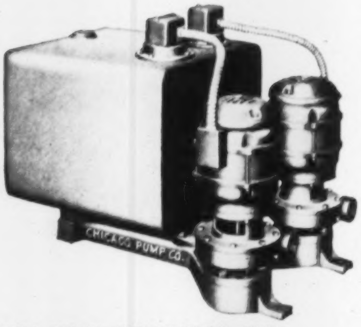
There's a Chicago Pump specifically designed for every type of building service steam heating system. No type of system has been overlooked by our engineers. *For any unusual condition; for below floor returns; for low vacuum systems; for small capacity, high pressure requirements; or for any standard system . . .* there is a Chicago Pump specifically designed 100% for the job. That means, there's no longer any reason for installing a pump that's not 100% suited to meet your needs. And you can be sure with a Chicago Pump that all ratings and receiver capacities meet or exceed standards of the American Society of Heating and Air Conditioning Engineers.

Write for details and free survey of your steam heating, pump requirements.

At left the TYPE AVC CONDENSATION PUMP & RECEIVER—Heavy cast iron receiver with low inlet for floor mounting or shallow pit. Cap. 500 to 10,000 EDR. Pressure 10-30 lbs.



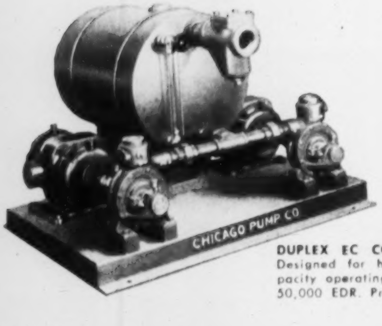
DUPLEX CONDO-VAC. RETURN LINE VACUUM AND BOILER FEED PUMP—Designed for vacuum heating systems. Water content remains constant up to boiling point. Cap. 2500 to 150,000 EDR. Pressure to 40 lbs.



SURE RETURN CONDENSATION PUMP & RECEIVER — Condensate flows by gravity from receiver through base to pump. Available in single or duplex units. Cap. up to 75,000 EDR. Pressures, low or medium.

CHICAGO PUMP CO.

TYPE CLLI VERTICAL CONDENSATION PUMP & RECEIVER—Designed for low return service and underground installations. Cap. 1000 to 40,000 EDR. Pressures 10 to 25 lbs.



DUPLEX EC CONDENSATION UNIT — Designed for high pressure, small capacity operating conditions. Cap. up to 50,000 EDR. Pressures up to 150 lbs.

fmc **CHICAGO PUMP COMPANY**
Subsidiary of Food Machinery and Chemical Corporation
BUILDING PUMP DIVISION
622 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Condo-Vac ®, Sure Return ®, AVC, LVC, Fire, House & Circulating Pumps, Pneumatic & Tankless Water Systems . . Flush Kleen ® Sewage Ejectors, Little Giant ® & Non-Clog Bilge Pumps. Pumps for every Industrial use

Announcing the kno-draft "ARCHITECTS' GROUP"

Square and Slotted Series Air Diffusers

Architects and engineers now have wide new latitude in selecting air conditioning outlets. The addition of this "Architects' Group" of square and slotted units to the famous line of round Kno-Draft Air Diffusers offers the industry's most complete line of engineered diffusers.

Kno-Draft Square Diffusers (Series KP): Two models, eight sizes. Neck diameters from 4 to 14 inches. Capacities from 50 to 1250 cfm. Sturdy pressed steel construction. Available, with or without patented sleeve damper or anti-smudge frame, for overlap installation in acoustical or plastered ceilings; or snap-in installation in T-bar ceilings. All units geometrically proportional so that, at constant neck velocities, static pressure is same for all sizes. Precise, *circular* diffusion patterns over large area assured.

Kno-Draft Slotted Diffusers (Series KLS): Two models. (1) Adjustable one-directional flow for offices, board rooms, etc. (2) Completely adjustable multi-directional flow for larger areas such as lobbies and auditoriums. Handsome extruded aluminum construction. Modules of 2, 3, 4 and 6 feet can be installed singly or butted in series to form continuous diffuser line on ceiling or wall. Exclusive Kno-Draft adjustable air direction vanes permit discharge pattern to meet individual job needs. Grid-type volume control damper permits easy system balancing. Damper grids equalize air distribution over length of diffuser.

For complete performance and selection data on the new "Architects' Group" of Kno-Draft Square and Slotted Diffusers, simply clip coupon to your letterhead and mail to Connor Engineering Corporation, Danbury, Connecticut.

CONNOR

kno·draft®

---- Square and Slotted Air Diffusers ----

CONNOR ENGINEERING CORP.
Dept. G-36, Danbury, Conn.

Please send free copy of your Bulletin K-27 describing the "Architects' Group" of Kno-Draft Square and Slotted Air Diffusers.

Name______________________________

Company______________________________

Address______________________________

City____________________ **Zone**____ **State**______

This "OGRE" can ruin a hot underground piping system that is turned on and off!

Let's look beyond just the initial cost of installing an underground piping system!

Consider for a moment how this system, once installed, will react to the thermal shock of turning it *on* and *off* (and what system isn't turned *on* and *off* occasionally). Unless the system is inherently capable of withstanding the shock of *on* and *off* service . . . that's when the "Ogre of Corrosion" swiftly becomes a real threat . . . and it costs *you* money!

Ask your Ric-wiL representative to explain how a Ric-wiL system protects you against *on* and *off* thermal shock.

Write for the *NEW* Ric-wiL Catalog or phone your Ric-wiL representative for a copy.

Quality Piping Systems . . .
. . . of Exceptionally High Thermal Efficiency

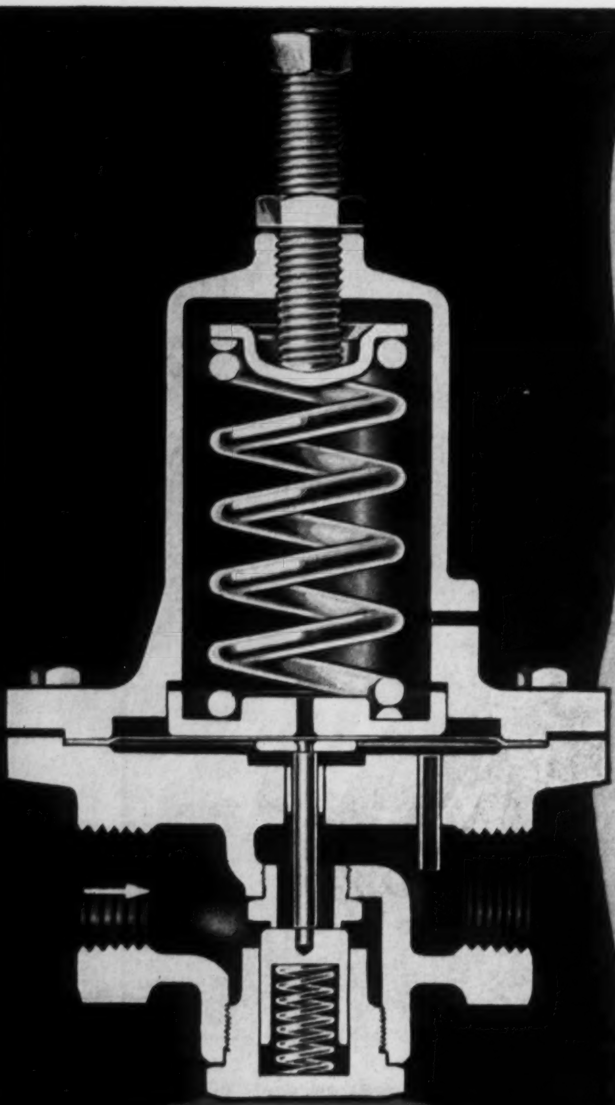
Ric-wiL INCORPORATED **PREFABRICATED INSULATED PIPING SYSTEMS**

BARBERTON, OHIO
Representatives In Principal Cities

Built for
Severe Service
O-B
VALVES
FLEXITITE
DISC
150
WSP
300
WOG
4559-V

All O-B Gate Valves feature the self-adjusting Flexitite Disc®. Its unusual design combines advantages of both the solid-wedge disc and the two-piece disc. Order O-B gates from your Ohio Brass distributor.

Ohio Brass
MANSFIELD OHIO, U.S.A.



FISHER®

Series 95

SELF-CONTAINED PRESSURE REGULATOR

. . . A simple, sturdy, self-contained regulator that is suitable for steam, air, gas, oil, water and other fluids.

SERIES 95 features hardened stainless steel trim . . . flat seat . . . machine lapped seating surfaces for tight shut-off for high temperature steam service.

Also available with soft seat construction for low temperature service.

Sizes: ¼", ⅜", ½", ¾", 1". Outlet pressures from 2 to 30 PSI; 15 to 150 PSI.

Size for size, compare its capacity.

Write for Bulletin C-95.

FISHER GOVERNOR COMPANY
MARSHALLTOWN, IOWA

CANADIAN PLANT:
WOODSTOCK, ONTARIO

LEADS THE INDUSTRY IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL

FISHER

Since 1880

IN THE DAYTON-BILTMORE HOTEL...
(A HILTON HOTEL)

The chilled water supply and return lines in basement are 3, 4, and 5 inch Chase Copper Water Tube and Solder Joint Fittings. Gate valves also by Chase.

AIR CONDITIONING WITH CHASE® TYPE L COPPER WATER TUBE *Exclusively!*

It's another 100% Chase job! From roof to basement, the new air conditioning installation—at the Dayton-Biltmore Hotel used over 20,000 feet of Chase Type L Copper Water Tube and more than $3,000 worth of Fittings.

As in other refrigeration installations, Chase Copper Tube and Fittings saved time and labor for the Dayton-Biltmore's air conditioning contractor, the York Corporation. That's because the precise tolerances of Chase Type L Tube and Solder Joint Fittings assure quick, accurate assembly and a pressure-tight system.

You can get hard temper Chase Type L in ¼" to 12" sizes. Comes in 20 foot lengths. Order today from the Chase Wholesaler nearest you!

Chase®
BRASS & COPPER CO.
WATERBURY 20, CONNECTICUT
SUBSIDIARY OF KENNECOTT COPPER CORPORATION

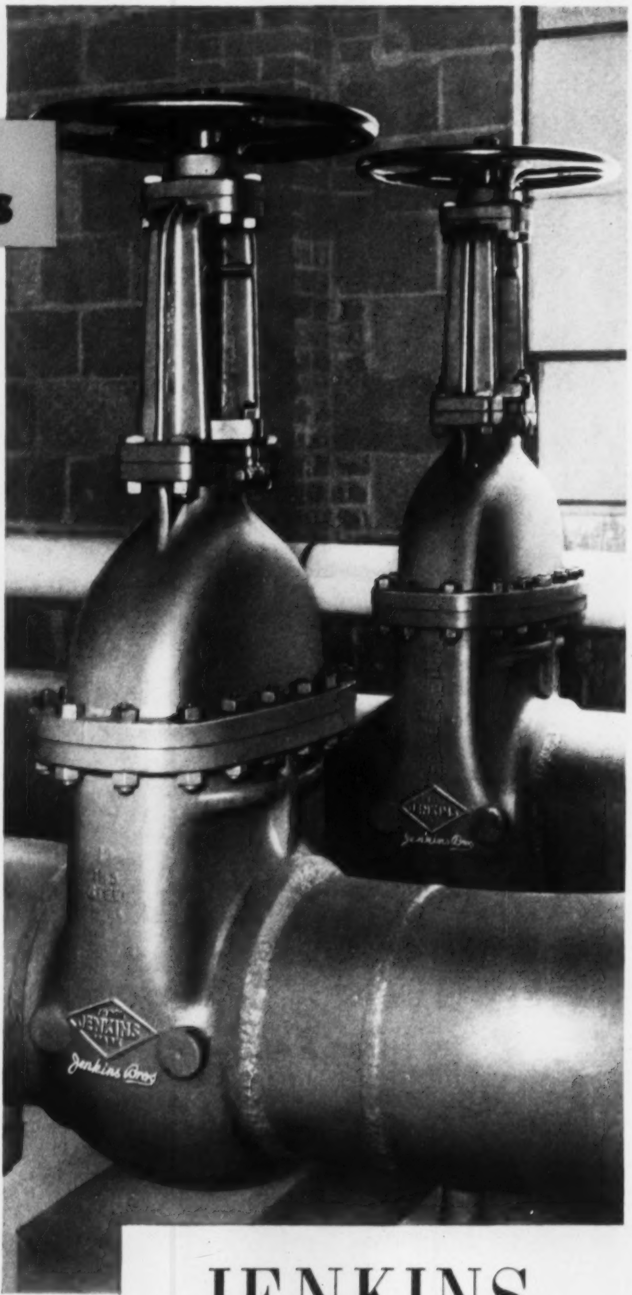
The Nation's Headquarters for Brass and Copper

Atlanta Baltimore Boston Charlotte Chicago Cincinnati Cleveland Dallas Denver Detroit Grand Rapids Houston Indianapolis Kansas City, Mo. Los Angeles Milwaukee Minneapolis Newark New Orleans New York Philadelphia Pittsburgh Providence Rochester St. Louis San Francisco Seattle Waterbury

For higher pressures
—higher temperatures

JENKINS CAST STEEL VALVES

serve the systems planned for lowest operating costs



The steadily increasing number of power generation and industrial processing installations of Jenkins Cast Steel Valves is clear evidence of economy-minded selection by valve specifiers and buyers.

Jenkins Cast Steel Valves offer any required combination of casting alloys and seating metals for any service up to 600 lbs. pressure and 1000°F. temperature. Along with specified ratings, buyers get the plus of Jenkins *extra value*, in design, in construction, in quality standards.

Test Jenkins Cast Steel Valves at the most punishing control points in your plant. Compare performance, and you'll see how they set new standards for long-range economy.

PATTERNS

Gates 2″ to 24″. Globes and Angles 2″ to 10″. Swing Checks 2″ to 12″. Non-return, stop and check Globes and Angles 4″ to 10″.

Screwed, Flanged, or Weld Ends.

PRESSURES

150 lb. — 300 lb. — 400 lb. — 600 lb.

PRESSURE CASTING ALLOYS

Carbon Steel (150 lb.)
Carbon Molybdenum Steel — 300, 400, 600 lb. Valves
Chromium Molybdenum Steel

SEATING METALS

H Monel
13% Chromium Stainless Steel
Carbon Molybdenum Steel, Stellite faced
AISI Type 316 Stainless Steel

JENKINS VALVES

LOOK FOR THE JENKINS DIAMOND

SINCE 1864 TRADE JENKINS MARK

Jenkins Bros

FOR COMPLETE SPECIFICATIONS, GET THIS CAST STEEL VALVE CATALOG

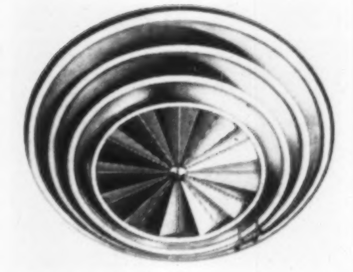
It describes all patterns, casting alloys, and seating combinations, with details of the *extra value* design and construction features. Gives pressure-temperature ratings, dimensions, and other technical data. Get a copy from your Jenkins Valve Distributor, or write: Jenkins Bros., 100 Park Ave., New York 17.

Jenkins
cast steel
Valves

SOLD THROUGH PLUMBING-HEATING AND INDUSTRIAL DISTRIBUTORS

EQUIPMENT DEVELOPMENTS

For reviews of Recent Trade Literature see Page 268



Ceiling Diffuser . . .

. . .designed for full variation of air patterns from horizontal to vertical—*Barber-Colman Co., Dept. HPAC, Rockford, Ill.*

Is said to be capable of driving heated air to floor from mounting heights to 50 ft with temperature differentials to 40 F deg. Recommended by company for heating, ventilating, air conditioning applications in manufacturing areas, gymnasiums, auditoriums, similar structures. When adjustment from floor not practical, adaptor unit can be furnished for adjustment through duct from crawl space above ceiling.

Tube Expander . . .

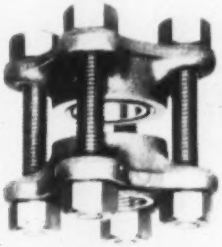
. . . with air operated control—*Thomas C. Wilson, Inc., Dept. HPAC, 21-11 44th Ave., Long Island City 1, N.Y.*

"Torq-Air-Matic" registers torque output readings directly in foot pounds instead of arbitrary units of measurement. Control feature eliminates tube over-rolling, under-rolling; tube bowing is held to minimum, says company.

Identification Plates . . .

. . .for electrical controls, panels—*G. F. Bunnell Co., Dept. HPAC, 34 Ocean Ave., Amityville, N.Y.*

Machine engraved lettering shows up brightly against anodized aluminum alloy surface, says company. Lettering available in 1/8, 3/16, 1/4 in. sizes. Same type plates also available in plastic.



O-Ring Flange Unions . . .

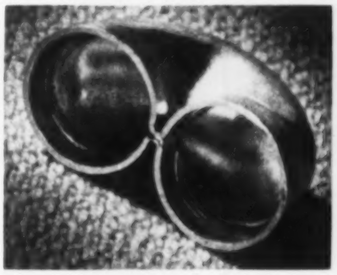
. . .for hydraulic equipment lines, process piping, water lines, refrigeration piping, other applications—*W S Fittings Div., H. K. Porter Co., Inc., Dept. HPAC, P.O. Box 95, Roselle, N.J.*

Line includes two-bolt, four-bolt types. O-rings provide tight seal against fluid pressure, says company. Unions available in 3000 lb class in screw end, socket welding types. Two-bolt unions available in 1/4 to 1 1/4 in sizes, four-bolt types in sizes 1 to 2 in.

Space Heater . . .

. . .direct fired, for oil, gas—*Airtherm Mfg. Co., Dept. HPAC, 700 S. Spring Ave., St. Louis 10.*

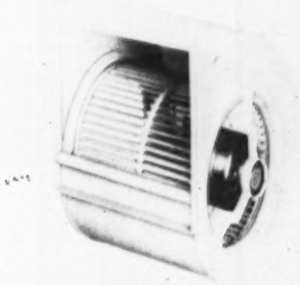
Cited features: high efficiency; quick to install; heats in winter, ventilates in summer; single switch changeover from oil to gas; electronic combustion control; in eight sizes 400,000 to 2 million Btu per hr output; with rolled shape stainless steel combustion chamber; each function individually controlled by seprate motor.



Return Bend . . .

. . .for 1/4 to 1 in. diameter tubes—*Gerry Tool Co., Dept. HPAC, Bristol, Conn.*

Sizes in steps of 1/8 in. with optional cup depth 3/16 to 1/4 in. Female connections. Tight bend is said to permit more tubes to be accommodated in small opening. Recommended by company for use on hot water heating equipment, air conditioners, refrigeration units, heat exchangers.



Direct Drive Blower . . .

. . .for heating, cooling, refrigerating, ventilating equipment—*Utility Fan Corp., Dept. HPAC, 911 E. 59th St., Los Angeles 1.*

"Big Boy" is said to deliver 1400 to 1500 cfm of air at 0.80 in. WG static pressure, with low outlet velocities. Designed for quiet operation. Features permanent split capacitor motor.

In-Line Relief Valves . . .

. . .in new 1/8 in. pipe size—*James Pond-Clark, Dept. HPAC, 2181 E.*

EQUIPMENT DEVELOPMENTS

Continued

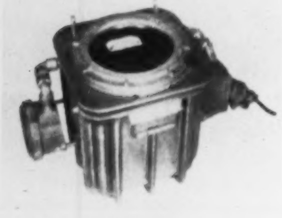
Foothill Blvd., Pasadena 8, Calif.

Available in brass or steel for pressures 50 to 1000 psi. Size added to company's standard "5100" series including 1/4, 3/8, 1/2, 3/4, 1 in. sizes with male and female outlet. Cited feature of series is that relief pressure, which is adjustable internally, is tamperproof when valve is installed. New 1/8 in. unit recommended by company for use with test bench equipment to prevent overpressurization on equipment, small pumps, gages; for use with block valves to provide thermal relief, etc.

Two-Stage Motor Pump . . .

. . .designed for leakproof handling of corrosive, toxic, explosive, other liquids—*Chempump Corp., Dept. HPAC, 1300 E. Mermaid Ln., Philadelphia 18.*

Pumping chambers can be piped in series (shown) or parallel for compact high head or high volume pumping, says company. Is said to give heads to 230 ft. Temperature, pressure limits are 450 F, 300 psi.



Analyzer, Alarm . . .

. . .for combustible gases—*Davis Instruments, Div. of Davis Emergency Equipment Co., Inc., Dept. HPAC, 47 Halleck St., Newark 4.*

Self contained, portable unit designed for use in or near hazardous locations. Is continuous sampling system operated by motor driven pump mounted inside. Cited features: visual, audible "high gas" signals; large, readily visible meter calibrated zero to lower explosive limit, showing gas or vapor concentration at all times; built-in "trouble indicating" circuit with indicating light, audible signal. Operating power is 110 volts, 60 cycles, single phase, 100 watts.

Alloy Fittings . . .

. . .designed with features which reduce friction loss, troubles resulting from abrasive wear—*Allen-Sherman-Hoff Co., Dept. HPAC, 259 E. Lancaster Ave., Wynnewood, Pa.*

Engineered primarily for hydraulic service, can also be used for pneumatic systems, company says. Line includes 90, 45, 22 1/2 deg elbows, integral lateral fitting with 45 deg angle connection for juncture of two pipe lines. Long turn radii is said to reduce friction loss. Fittings range 4 to 12 in. in 2 in. increments.

Fluid Drive . . .

. . . for use with fractional horsepower motors—*Will-O-Hill Industries, Inc., Dept. HPAC, 37611 Euclid Ave., Willoughby, Ohio.*

Device is said to have high efficiency, operate without slippage while under full load. New torque conversion principle provides safety protection against shock overloading, says company.

Valves . . .

. . .for high pressure, high temperature service—*Yarnall-Waring Co., Dept. HPAC, 107 Mermaid Ave., Philadelphia* 18.

Recommended by company for general boiler room use including drain service on water wall headers, economizers, water columns and gages; drain and vent services on superheaters and steam lines; shutoff service on sampling lines, bypasses, water gages, water columns, instruments. "Welbond" units available in seven sizes 1/2 to 2 1/2 in., for pressures 1500 and 2500 psi at 1050 F.

Water Treatment . . .

. . .controller for air conditioning, other recirculating cooling water systems — *Heller Laboratories, Inc., Dept. HPAC, 124 Fort Lee Rd., Leonia, N.J.*

"Hydrotrol" designed to maintain fixed range of mineral concentration, at same time feed chemicals at desired feed settings. Is said to make possible successful treatment of any recirculating cooling water system, without frequent compensating adjustments.

Metals are the Best Insulators

Against Heat, Cold, and Vapor in Building Spaces

The surfaces of ordinary IRON have about 4 times the reflectivity against heat rays that the surfaces of asbestos, asphalt, paper, brick, plaster, wood and other ordinary building materials have. Brass, gold, silver and ALUMINUM surfaces have about TEN TIMES the reflectivity against heat rays that these non-metallic materials have. Aluminum surfaces, for example, have a 97% reflectivity for RADIATION, whereas the surfaces of most building materials have a reflectivity of only 10%.

RADIATION (heat rays) is responsible for about 65% to 80% of all heat flow sideways in building spaces; 55% to 75% upwards; and 93% downwards.

Air space has low density, therefore heat flow by CONDUCTION through the **spaces** inside building walls, roofs, attics or floors is slight. CONVECTION can account for 15% to 30% of the heat flow sideways in such spaces, and up to 45% upwards. There is NO convection downwards.

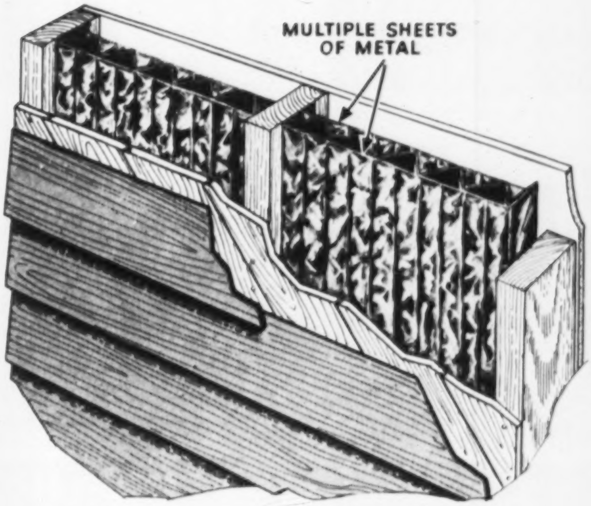
AN EXCELLENT HEAT AND VAPOR BARRIER

Multiple sheets of metal, spaced apart, make an excellent barrier to heat and vapor flow in any direction. Prefabricated Multiple Aluminum is installed in one simple operation. Tough metallic sheets are automatically expanded so as to form alternating layers of aluminum, fiber and low density reflective air spaces. The fibrous and metallic sheets retard inner and outer convection.

Its continuous metal sheets, up to 750 feet long, have almost zero permeability to water vapor. Infiltration under flat stapled flanges is slight. Condensation formation on or within this type of insulation is minimized by its scientific construction. More than 300 million square feet are in use today.

To obtain MAXIMUM, **uniform-depth** protection against heat loss and condensation formation, it is necessary to use the new **edge-to-edge** multiple aluminum*, **each** sheet of which stretches from joist to joist.

*Patent applied for.



FREE! RADIATION TABLE AND ASHAE BOOKLET

A very interesting and useful "Radiation Table" listing the Emissivity, Absorptivity, and Reflectivity of a long list of materials has been prepared by Alexander Schwartz, president of Infra Insulation, Inc. It is yours for the asking.

Also yours for the asking is a discussion of how and why aluminum insulates, even under extreme conditions. It will be found in the booklet, *Thermal Test Coefficients of Aluminum Insulation for Buildings*, published by the American Society of Heating & Air-Conditioning Engineers. A free copy and samples of the new insulation sent by us on request.

COST OF EDGE-TO-EDGE INFRA
Multiple Aluminum Insulation
installed in new construction
between wood joists,
material and labor
Type 6-PS about 10¢ sq. ft.
Type 4-PS about 8¢ sq. ft.

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525 Broadway, N.Y.C., Dept. H-3
☐ Please send FREE ASHAE booklet. (Therm. Test, etc.)
☐ Heat ray reflectivity table. ☐ Samples.

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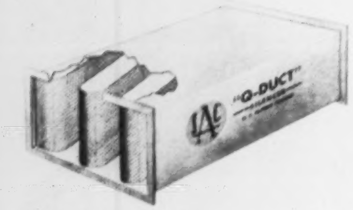
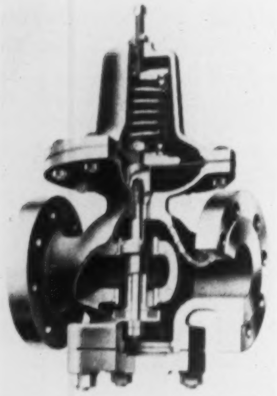


Silencing Units . . .

. . .for air conditioning duct noise—*Industrial Acoustics Co., Inc., Dept. HPAC, 341 Jackson Ave., New York 51.*

Prefabricated "Q-Ducts" can be fitted into air conditioning system during design stage of installation. Made possible since units available in 148 sizes, says company. Acoustic noise reduction curves, pressure drop data presented for each unit. Standard unit measuring 2 to 10 ft is said to provide as much noise control as conventional lined duct 30 to 100 ft long.



Valve . . .

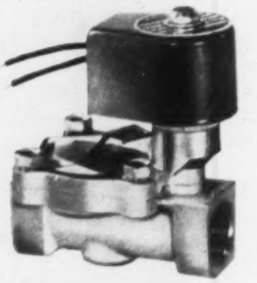
. . .for water pressure reducing—*Spence Engineering Co., Inc., Dept. HPAC, Walden, N.Y.*

"D25" is said to be capable of regulating water flow to such fast acting equipment as flushometers, snap cocks. Incorporates high pressure molded diaphragm, heavy spring chamber construction for operation in reduced pressure range 30 and 80 psi. Recommended by company for industrial processing operations; municipal or plant water mains; apartment houses, hotels, office buildings, hospitals to provide each floor with steady pressure.

Room Conditioners . . .

. . .with 200, 400, 600 cfm capacities—*Acme Industries, Inc., Dept. HPAC, Jackson, Mich.*

For remote installation. Designed for heating and cooling, dehumidification, ventilation, filtering and circulation. With individual room control. Four-speed fan control, optional automatic or manual hot and cold water controls "tailor" temperature in each room, says company.



Solenoid Valve . . .

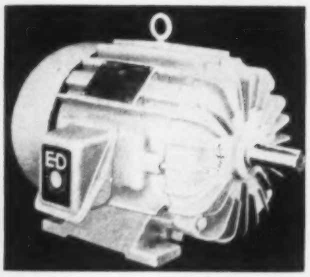
. . .with full area port—*Automatic Switch Co., Dept. HPAC, 391 Lakeside Ave., Orange, N.J.*

Self contained, internal pilot operated, $^3/_4$ in. unit has forged brass body and bonnet, "hycar" diaphragm. Available normally closed, normally open. Can be mounted in any position, says company. Operating parts are core, spring, diaphragm. Designed to handle oil, water, gas, etc., to 125 psi. Enclosures are either pressed steel, water tight, or explosionproof.

Dial Thermometer . . .

. . .for industrial, institutional services—*Taylor Instrument Companies, Dept. HPAC, 95 Ames St., Rochester 1, N.Y.*

Recommended by company for use on pipe lines, hot water tanks, storage tanks, air ducts, similar applications. Is said to be accurate within ± 1 percent of change over range. Available with 3 or 5 in. dial. Stem lengths are 4, 6, 9, 12 in. Ranges of various instruments run 40 to 750 F.



TEFC Motor . . .

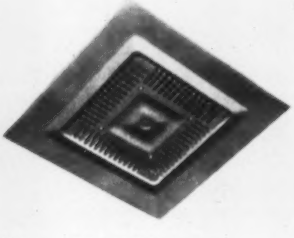
. . .rerated to NEMA dimensional standards—*Electro Dynamic Div., General Dynamics Corp., Dept. HPAC, Bayonne, N.J.*

Housing, end brackets constructed of solid cast iron, ribbed frame. Designed for operation where noncombustible dust, moisture prevalent. In frame sizes 182, 183, 213, 215, 254U, 256U. Larger ratings available soon, company reports.

Slide Rule . . .

. . .tinted to reduce eye strain upon user—*Pickett & Eckel, Inc., Dept. HPAC, 1109 S. Fremont Ave., Alhambra, Calif.*

Light alloy rule made in green-yellow to eliminate violet, red rays which focus in front of, behind retina to cause eyestrain, blurring. Available in 6, 10 in. trig, log-log, standard rules. Others made to special order.

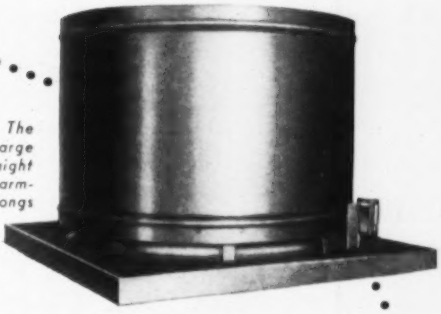


Ceiling Air Diffuser . . .

. . .designed to be tamperproof, vandalproof—*Connor Engineering Corp., Dept. HPAC, 500 Fifth Ave., New York 36.*

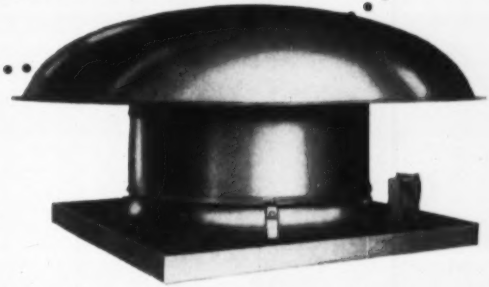
Recommended by company for institutions, sanatoriums where such may be encountered. Mounted flush against ceiling, with air discharge through slots which fit firmly against outer plate, outlet presents sturdy, unbroken exterior to discourage attempts at damage, says company.

For whisper-quiet operation on schools, hospitals. The all-new Centrifugal Roof Ventilator runs at low speeds, moves large volumes of air efficiently against static pressures.



For oil or grease laden air. The newly redesigned Vertical Discharge Roof Ventilator exhausts air straight up at high velocity. It keeps harmful residue off the roof . . . prolongs roof life.

3 new LOW–SILHOUETTE ROOF VENTILATORS



The Power-Flow Roof Ventilator is a ruggedly built unit in an aerodynamically correct, weatherproof housing. Most popular of all for general useage.

Low in silhouette . . . distinctively profiled . . . these units blend well with modern architecture. What's more, they deliver all the air you pay for. All performance ratings are the output of the *completely assembled* unit . . . obtained from wind tunnel tests as per Standard Test Code for Power Roof Ventilators . . . conform to U. S. Department of Commerce Standard 178-51. Capacities up to 40,900 CFM. Send for catalogs today.

3 New catalogs

MAIL COUPON TODAY

De Bothezat FANS

A DIVISION OF

American Machine and Metals, Inc.

EAST MOLINE, ILLINOIS

DeBOTHEZAT FANS, Dept. HP-356
Division of American Machine and Metals, Inc.
East Moline, Illinois

Please send catalogs on your following roof ventilators . . .

☐ *Centrifugal,* for quiet operation
☐ *Vertical Discharge,* for oil or grease laden air
☐ *Power-Flow,* for normal industrial air
☐ All three ventilators

FIRM

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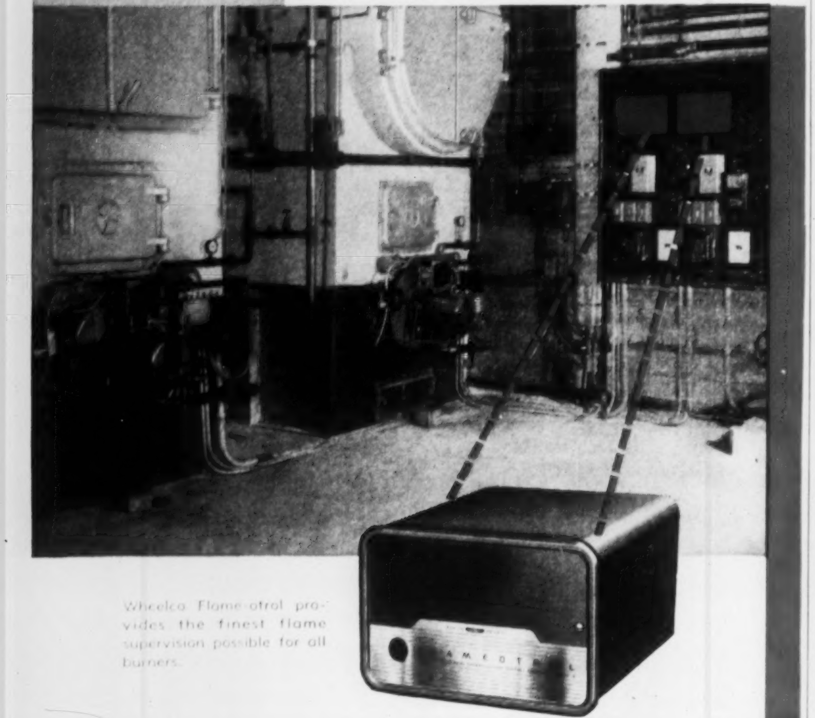
THE MARK OF QUALITY

BARBER COLMAN

Wheelco Instruments

Flame-otrol Combustion Safeguard System gives positive protection for any burner, any fuel



Wheelco Flame-otrol provides the finest flame supervision possible for all burners.

Wheelco Flame-otrol combustion safeguard systems offer unfailing, positive protection for any burner—gas, oil, combination gas-oil.

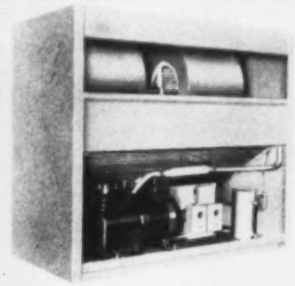
One basic type, the Series 1470 Conductivity-Rectification system, uses the ability of a flame to conduct current to protect manually or semi-automatically ignited gas, oil, or combination fuel burners.

Series 1570 Infrared System, the other basic type, depends on the fluctuating current of a flame frequency for relay response. All Wheelco Flame-otrols offer the advantages of compact plug-in design, standard electronic tubes, heavy-duty construction, and other advanced features. Your Wheelco field engineer can help you select the right flame supervision system, choosing from a full line of instruments and accessories. Call him today.

WHEELCO INSTRUMENTS DIVISION
Barber-Colman Company
DEPT. C, 1501 ROCK STREET, ROCKFORD, ILLINOIS
BARBER-COLMAN OF CANADA, LTD., Dept. C, Toronto and Montreal, Canada

EQUIPMENT DEVELOPMENTS

Continued



Air Cooled Condenser . . .

. . . with 10 ton capacity—*Typhoon Air Conditioning Co., Dept. HPAC, 505 Carroll St., Brooklyn 15*

Model "10ACCU" (shown) coupled with "10LSU" low side air handling unit designed for water scarcity, installation space economy. Condensing unit engineered for remote installation. Air handling unit may be suspended from wall or ceiling or recessed into wall. Cited applications: supermarkets, small shops, industrial plants, offices, others where installation space is at premium.

Cooling Towers . . .

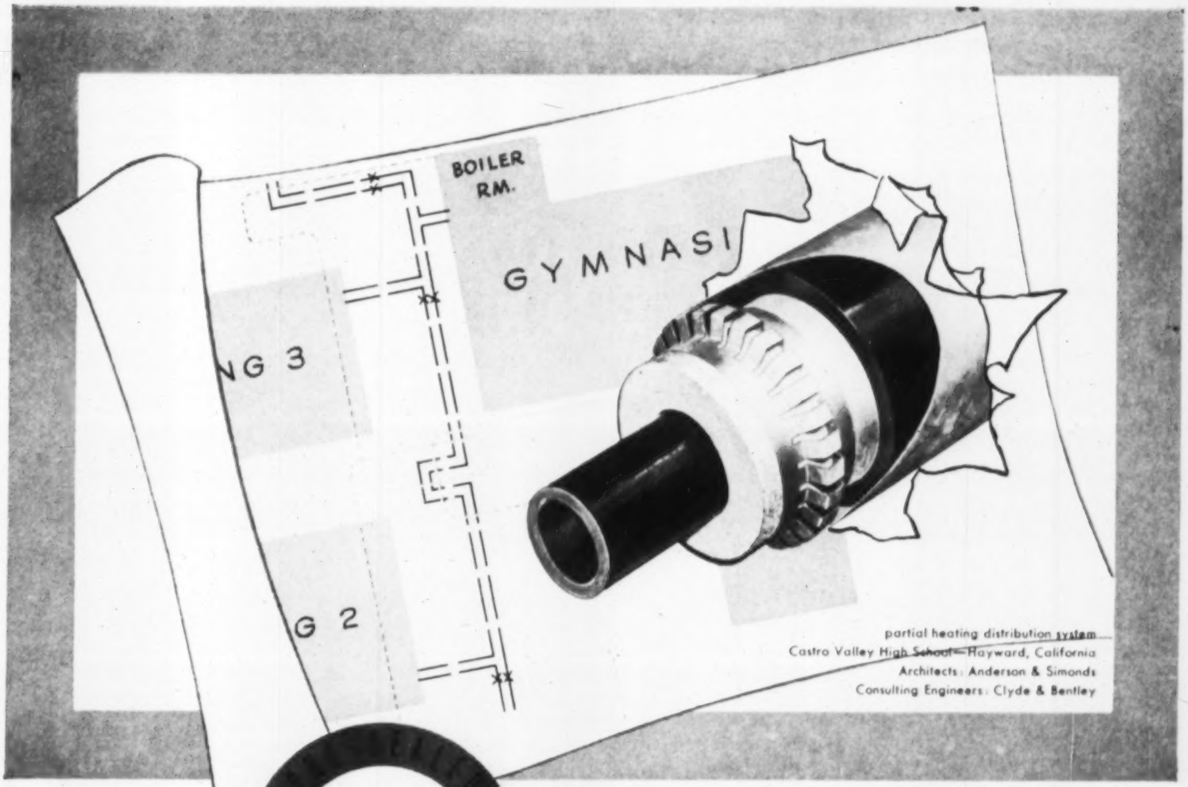
. . . in sizes 3 to 60 tons—*Schnacke, Inc., Dept. HPAC, 1101 N. Governor, Evansville 7, Ind.*

Shown is 60 ton "Thermatrol" unit. Towers completely assembled, include centrifugal fans. Larger ones shipped in two sections.

Valve Power Unit . . .

. . . for controlling gas pressure build-up in supply lines—*Eclipse Fuel Engineering Co., Dept. HPAC, 1002 Buchanan St., Rockford, Ill.*

Series "R" reverse acting power



partial heating distribution system
Castro Valley High School—Hayward, California
Architects: Anderson & Simonds
Consulting Engineers: Clyde & Bentley

DURANT

LOW INSTALLATION COST TODAY

LESS MAINTENANCE COST TOMORROW

Expanding school populations across the nation focus increasing attention on costs and on Durant factory-prefabricated insulated pipe systems.

ORIGINAL COST is low with D. I. P. The packaged increments of conduit and standard fittings are rapidly field-joined, with only the pipe itself requiring a weld. No concrete tunnels, masonry, special underground supports, or sub-drains are needed.

CONTINUED COST is less with D. I. P. Its integral layer of non-porous asphalt completely waterproofs the insulation, and prevents corrosive elements from reaching the pipe. Even complete submersion is harmless! Maintenance-creating manholes, expansion joints and other devices can be eliminated by use of standard D. I. P. expansion fittings.

54-PAGE D.I.P. CATALOG #35 GIVES COMPLETE DETAILS, WRITE FOR IT.

D.I.P.* STAFF ENGINEERS AND REPRESENTATIVES IN PRINCIPAL CITIES AND IN CANADA ARE AT YOUR SERVICE D.I.P.*

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Wing

REVOLVING UNIT HEATERS

The Moving Airstream Touches the Worker for only a few Seconds at a Time

NO SICKENING HOT BLAST!

That is the big difference between all other unit heaters and the WING Revolving Heater. The soft airstream from the slowly revolving discharge outlets creates a warm, gentle, yet live sensation of comfortable well-being that is without equal for keeping workers contented and productive.

...And in the Summertime with the steam turned off and the fans on, these same revolving discharge outlets will create a pleasing, cooling effect on the hottest days.

L. J. Wing Mfg. Co.
140 Vreeland Mills Rd., Linden, N. J.
Factories: Linden, N. J. & Montreal, Canada
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L. J. Wing Mfg. Co., Linden, N. J. HP-3
Please send me Bulletin HR-6A-Revolving Heaters
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Firm
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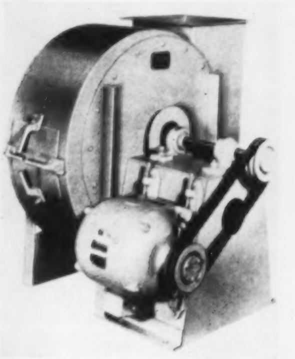
City Zone State

unit combined with "Lock-Tite" safety shutoff valve designed to positively shut off gas supply to burner in case incoming pressure builds up beyond safe point. Units available in four standard tripping pressures ranging to 10 psi.



Exhausters . . .

. . . designed to exhaust industrial waste materials—*Chicago Blower Corp., Dept. HPAC, 9869 Pacific Ave., Franklin Park, Ill.*

"Steel Plate" units available with direct or v belt drive. Are furnished with different types of wheels for wood shavings, heavy materials handling, clinging types of fibrous material. Available in nine drive arrangements in two classes for temperatures to 1000 F. Wheel diameters range 9½ to 60½ in. For volumes to 50,540 cfm.

Air Conditioners . . .

. . . designed for greater cooling efficiency, with adjustable mountings and pushbutton controls—*Servel, Inc., Dept. HPAC, Evansville, Ind.*

In five models. "Custom" line has ¾ and 1 hp sizes, "Eldorado" line available in ¾, 1, 1½ hp sizes. Quiet operation of units is said to be assured by spring mounting, rubber cushioning, cabinet insulation, centrifugal blower fan. For mounting flush with draperies, on centerline of cabinet, with back of unit flush to outside wall, or at intermediate points. Pushbutton control selects five degrees of cooling and "off."

SARCO TYPE S CONDENSATE PUMP

Low inlet — 7½" above floor ... close coupling ... no sub-base needed ... easy inspection.

Sarco Condensate and Vacuum Pumps give you this big advantage...

UNDIVIDED RESPONSIBILITY

by Sarco for pumps as well as heating specialties!

Now Sarco expands its extensive heating line ... by adding *condensate and vacuum pumps* ... offering you in still larger measure the protection and convenience of *undivided responsibility.*

Shown above is one of the many Sarco pumps ... it's the streamlined Sarco type S condensate pump. Designed and built to Sarco's traditionally high quality standards, it assures you top performance and long, trouble-free life. The many advantages include:

... Low 7½" inlet ... Close coupling ... No sub-base needed. Inspection? Just unscrew 3 nuts and lift the motor; no need to disconnect the piping. For a complete list of features, mail the coupon today.

- **Selection** — The experienced Sarco-Sarcotherm engineering staff will gladly help you select the right Sarco condensate or vacuum pump for each job.
- **Undivided Responsibility** — From *one* reliable "Complete Line" source ... SARCO-SARCOTHERM ... get not only condensate and vacuum pumps but also heating specialties, steam traps, temperature regulators, finned-tube radiation, and weather-compensated control systems for steam and hot water heating.

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MAIL COUPON FOR THESE BULLETINS

SARCO
Type S
Condensate
Pumps
SARCO
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Please send me:

☐ Bulletin on New Sarco type S Condensate Pumps.

☐ Bulletin on all Sarco Vacuum and Condensate Pumps.

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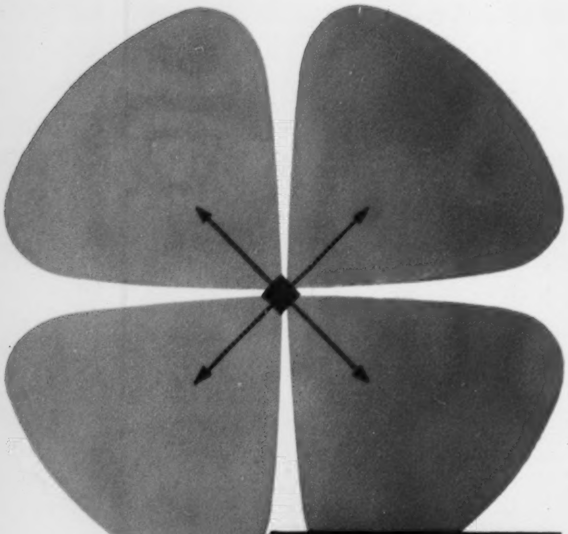


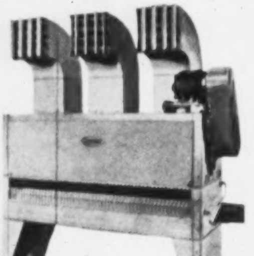
CHECK THE "CLOVER LEAF" FOR SPREAD!

Carrier's new 4-way Unit Heater is the only one with a "clover leaf" pattern of air diffusion. You can hang one of these units in the center of a building up to 100-feet wide and spread heat all the way to the four walls.

Heat goes farther. You save on installation and operating costs. Gives coverage of 3 conventional, fixed-outlet projection unit heaters.

The new 4-way Carrier Unit Heater, for steam or hot water, comes in 8 sizes—from 55,000 to 600,000 Btu/hr. You'll find your local jobber-distributor listed in the Classified Telephone Directory.

Carrier Makes a Complete Line of Unit Heaters, including the versatile heat diffuser shown here. Can be floor mounted, vertically or horizontally suspended. Sizes: 80,000 to 1,620,000 Btu/hr. With over 50 years' leadership in temperature control, *Carrier knows heating!* Carrier Corporation, Syracuse, New York.

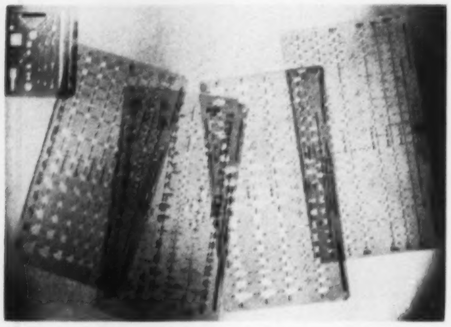


Carrier

air conditioning · refrigeration
industrial heating

EQUIPMENT DEVELOPMENTS

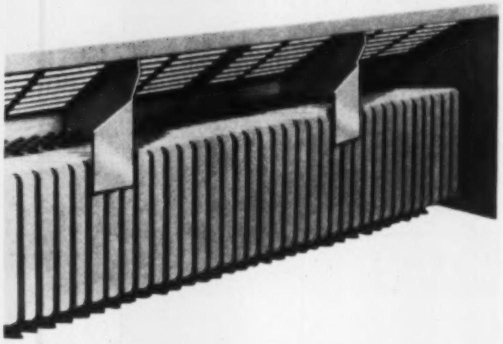
Continued



Template Kit . . .

. . . for making fast general layouts, detailed drawings of oil, gas, water, chemical, steam piping and valving systems—*A. Lawrence Karp, Dept. HPAC, 16 Putnam Park, Greenwich, Conn.*

Matched set of five reversible templates includes all American Standard symbols, says company, has provisions for new or special symbols. Made of rigid vinyl.



"Snap-on" Enclosure . . .

. . . for quick installation on finned pipe radiators—*Slant-Fin Radiator Corp., Dept. HPAC, 87-49 130th St., Richmond Hill, N.Y.*

"Snap-on Slope Top" developed to eliminate complicated, costly installations while providing durable construction. By means of seating brackets welded permanently inside, cover can be snapped directly onto heating element. In stock lengths 2, 3, 4, 5, 6, 8, ft. for 1, 2, 3 tier heights with 3 ¼ or 4 ¼ in. square or slant fins.

Room Air Conditioner . . .

. . . designed to reduce airborne bacteria—*Emerson Radio and Phonograph Corp., Dept. HPAC, Fifth Ave. at 59th St., New York 19.*

Also performs usual cooling, ventilating functions of air conditioner. "Electronic Germ Killer" unit is said to reduce airborne bacteria in room to insignificant numbers. Is feature of company's 1956 line, available in sizes 1/3 to 2 hp.

• Soap solution • Calcium hypochlorite •

• Water containing abrasive particles • Carbon slurry • Ferric hydroxide •

Soap solution containing sand and ground glass • 25% grape juice concentrate •

• 50% caustic soda • Ferric sulphate • Ammonium sulphate • Demineralized water

Trisodium phosphate • Reactivated carbon • 1% chlorine solution • Sulphuric acid •

• Weak black liquor •

• Slurries

• 10% chromic acid • Humic acid •

Waste sulphite liquor • Bleach liquor

Acid mine water • Liquid latex •

• Alkylaryl sulfonate •

• Sodium hydroxide •

• Calcium hydroxide •

• Calcium bisulphite •

Calcium hypochlorite •

• Demineralized water

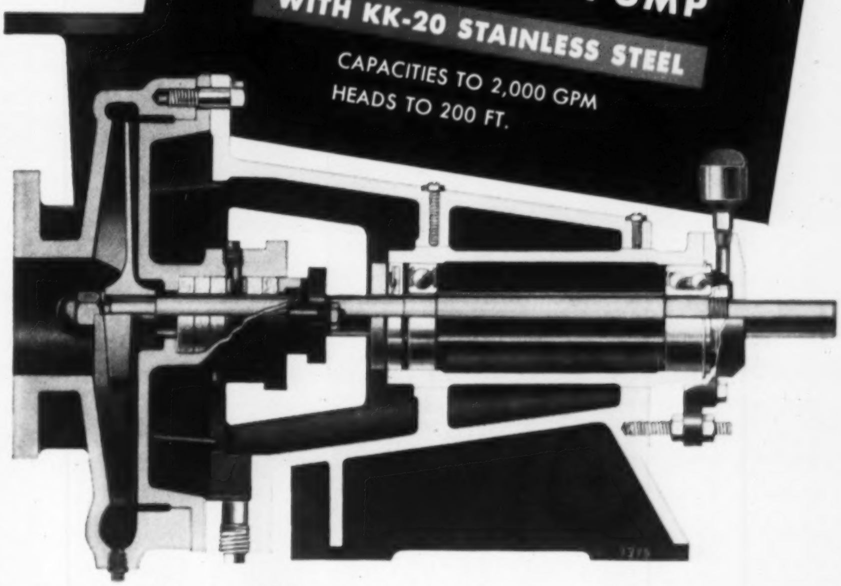
One pump handles all these problem liquids

DE LAVAL

CPO PROCESS PUMP

WITH KK-20 STAINLESS STEEL

CAPACITIES TO 2,000 GPM
HEADS TO 200 FT.



The De Laval CPO Process Pump has stainless steel parts where it comes in contact with the liquid. The casing, end head, stuffing box, impeller, seal ring and gland are all of De Laval KK-20 (20-28 stainless with molybdenum and copper). The shaft and lock nut are made of other suitable stainless steels. • Three bearing pedestals accommodate nine wet end sizes. Off-the-shelf parts in ferrous and nonferrous combinations permit changing size or metallurgy after installation. CPO pumps are available with both conventional packing and mechanical seals.

WRITE FOR BULLETIN 1125-B

DE LAVAL *Centrifugal Pumps*

DE LAVAL STEAM TURBINE COMPANY

871 Nottingham Way, Trenton 2, New Jersey

DL-331

Here's why
TACO CHILLERS
are easy, long-life installations!

CONTROLLED VELOCITY Refrigerant velocity is controlled through headpasses and tubes, to prevent oil-logging in the chiller.

Water velocity, through the shell, is controlled by engineered baffle spacing for efficient heat transfer without excessive pressure drop.

U-BEND CONSTRUCTION A TACO feature that eliminates any possibility of leaks at the rear end of the chiller.

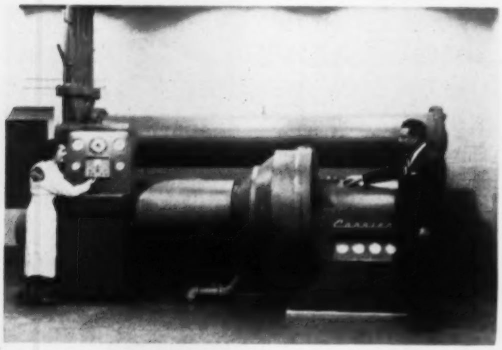
Capacity Range: Up to 130 tons
Sizes: From 8" to 20" diameters
For use with Freon-12 and Freon-22

It pays all ways to install TACO *Quality Controlled* products.

Condensate Coolers • Converters • Chillers • Circulating Pumps
Fuel Oil Heaters • Oil Coolers • Tank Heating Units • Water Heaters

TACO HEATERS, INCORPORATED
1160 Cranston Street
Cranston 9, Rhode Island

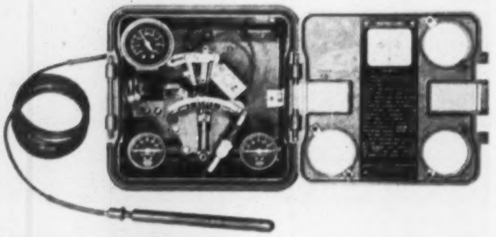
Taco



Refrigerating Machine . . .

. . . with hermetic centrifugal operation, designed to reduce installation cost, provide pushbutton operation and high efficiency for large air conditioning systems —*Carrier Corp., Dept. HPAC, Syracuse 1.*

Engineered especially for multistory buildings. Can also chill water for industrial process applications, company reports. In unit, compressor and electric motor drive united in single casing. Is said to have very quiet operation. Operates on pressing "stop-go" button on control console. Available in 30 capacities ranging 100 to 325 tons.



Temperature Controller . . .

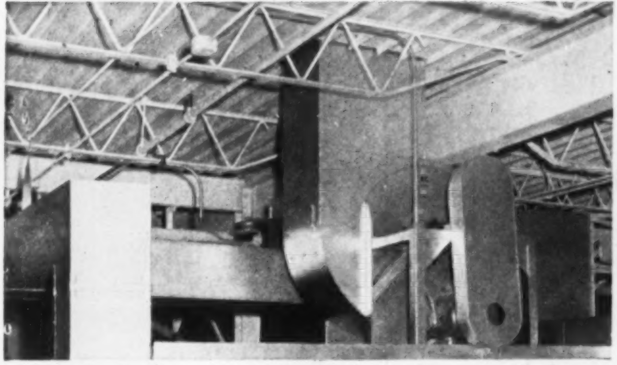
. . . for positive fluid flow control through diaphragm operated valves, based on temperature variations—*Black, Sivalls & Bryson, Inc., Dept. HPAC, 7500 E. 12th St., Kansas City 26, Mo.*

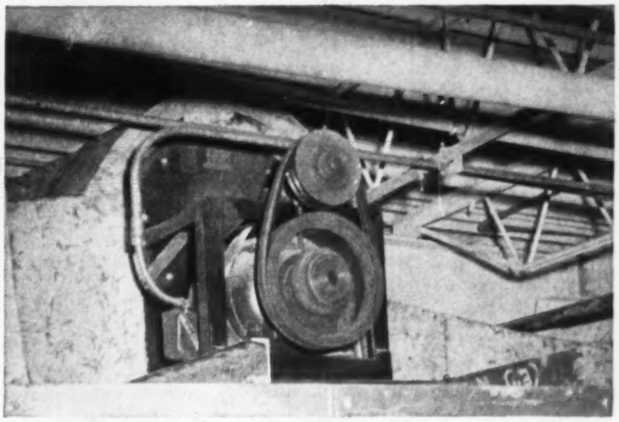
Type 1160 unit equipped with external vapor tension thermal system to actuate power unit in pilot to offer choice of temperature ranges. By adjustment, permits either 100 percent throttling action or "on-off" snap action within wide limiting range, says company. Two pressure gages, temperature indicator built into pilot case.

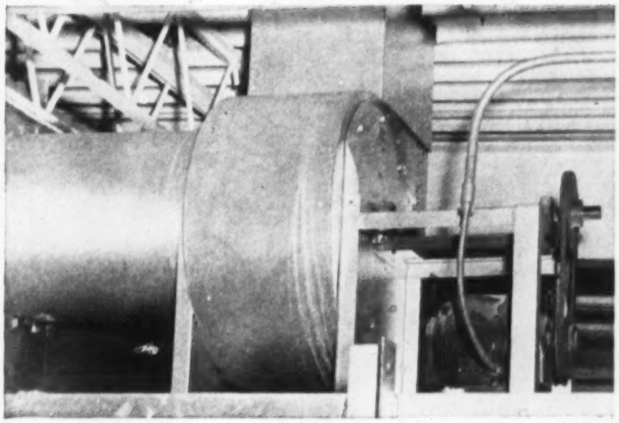
Time Switch Motor . . .

. . . now incorporated on all of company's astronomic program, "Switchmaster" time switches—*Tork Clock Co., Inc., Dept. HPAC, Mt. Vernon, N.Y.*

Unit is said to insure performance year 'round. Has −40 to 140 F temperature range. May be installed in any position. Sealed against moisture, dust.







Heat and Fumes
don't faze these *Specially Engineered* Peerless Blowers!

- Top picture: Peerless 222G Backward Curve Blower exhausts hot air from paint baking oven. Center picture: Peerless 135K Blower circulates hot air in paint drying oven. Bottom picture: Peerless 270L Blower exhausts fumes from paint drying oven. Another Peerless 165F Blower (not shown) in same plant forces hot air into paint baking oven. Operating temperatures: Between 300° to 500° F.

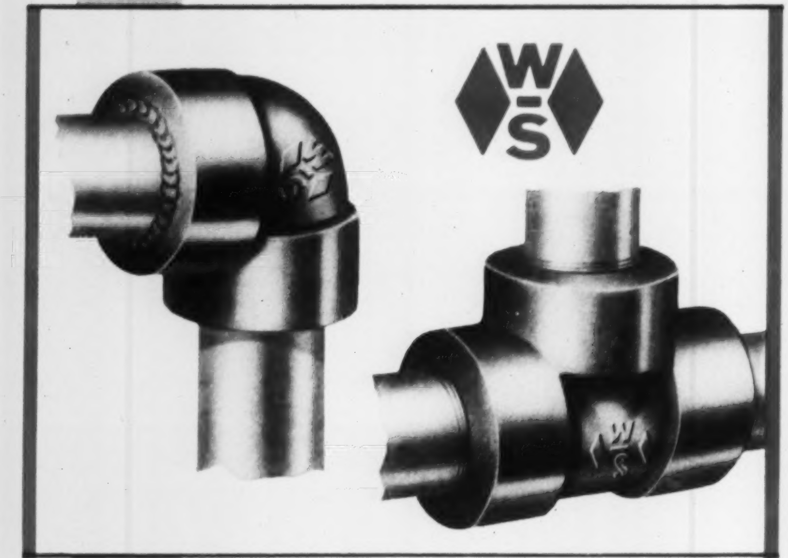
- These four specially-designed and engineered Peerless Blowers operate quietly and efficiently in the finishing department of one of the nation's most modern production plants. They were designed for economical, dependable performance in extreme heat. We can do the same for you. Installations like this are our specialty. Contact us today!

Write, Wire or
Phone for Bulletin
SDA-160 Today!

Peerless Electric

FAN AND BLOWER DIVISION
THE *Peerless-Electric*® COMPANY
FANS · BLOWERS · ELECTRIC MOTORS · ELECTRONIC EQUIPMENT
1409 W. Market St. WARREN, OHIO

2 Safe Ways to PROTECT Pressure Piping . . .



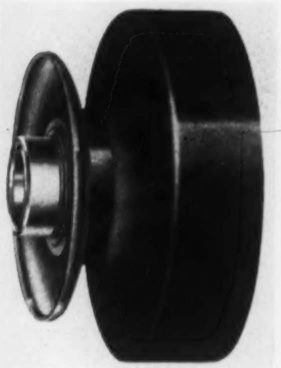
W-S SCREW-END and SOCKET-WELDING FORGED STEEL FITTINGS

Pipe joints are potential trouble spots in high pressure piping systems. Change in direction of flow causes turbulence, erosion and vibration. Watson-Stillman fittings are made to absorb this type of punishment. They're drop-forged for strength and toughness and safety-factor designed for the protection of your piping.

Choose between a welded piping system and a screwed one to suit your needs. Then choose W-S Screw-End or Socket-Welding Fittings to join your pipe. They're available in sizes ⅛" to 4" for piping up to 6000 lb. W.O.G. class. For high temperature or corrosive service you can get W-S Forged Stainless and Alloy Steel Fittings, too. Send today for our informative catalogs.

W S
FORGED STEEL FITTINGS

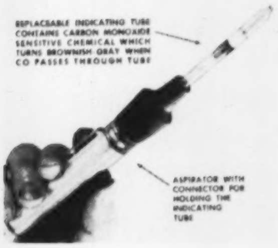
W-S FITTINGS DIVISION
HKP
H. K. PORTER COMPANY, INC.
Roselle, New Jersey



Clutch . . .

. . . for fractional horsepower motors — *Mercury Clutch Div., Automatic Steel Products, Inc., Dept. HPAC, Canton, Ohio.*

Designed for 1/6, 1/4, 1/3 hp electric motors. Recommended by company for original equipment on air conditioners, furnace blowers, power tools, vacuum pumps. Cited advantages for manufacturers are improved product performance, low initial cost, ease of installation; for consumers are effective motor protection against overload, efficient performance, longer belt life.

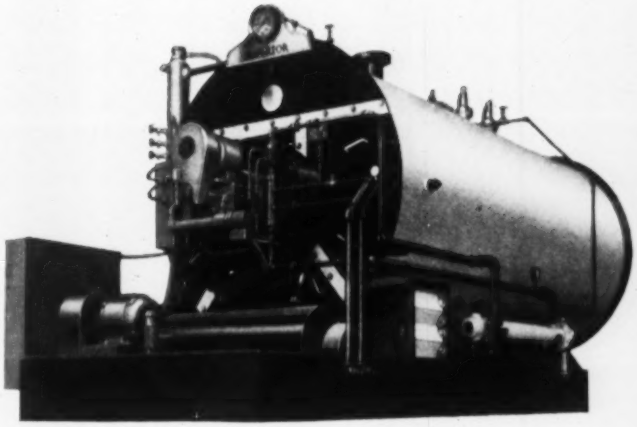

REPLACEABLE INDICATING TUBE CONTAINS CARBON MONOXIDE SENSITIVE CHEMICAL WHICH TURNS BROWNISH GRAY WHEN CO PASSES THROUGH TUBE
ASPIRATOR WITH CONNECTOR FOR HOLDING THE INDICATING TUBE

Detector . . .

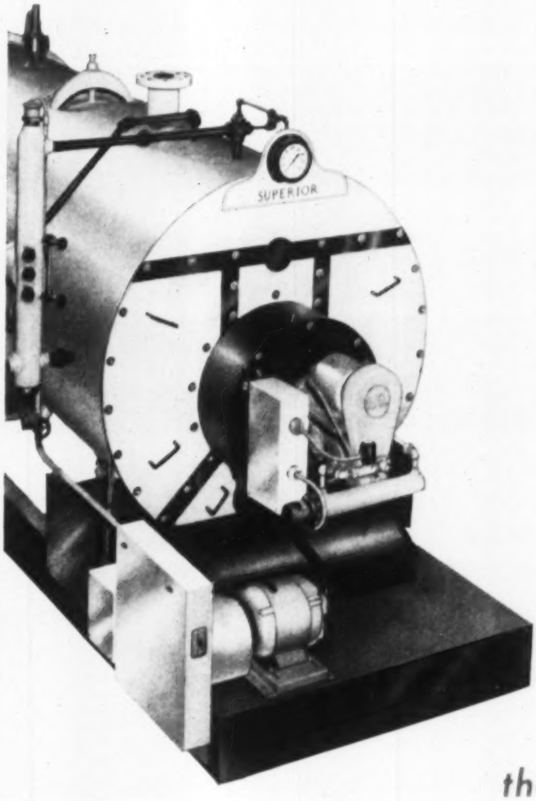
. . . for carbon monoxide — *Bacharach Industrial Instrument Co., Dept. HPAC, 7301 Penn Ave., Pittsburgh 8.*

Pencil sized "Monoxor" designed to show at a glance if, in air being tested, carbon monoxide is present in any dangerous concentration. Is said to show presence of concentrations as low as 40 parts CO per million parts of air. Comprises replaceable indicating tube, aspirator pump with connector for holding indicating tube during test. When carbon monoxide passes through tube, chemical changes color.

CLEANER
QUIETER
SAFER



. . . and built for years of extra service



SUPERIOR STEAM GENERATORS are the only packaged units with an integrated and built-in *induced* draft system (as shown at the left).

Superior's induced draft maintains a negative pressure in all 4 passes of the boiler as well as in the combustion chamber eliminating the need of spring-loaded pressure relief doors commonly used on forced-draft types, and eliminating the forcing of dirt, soot or combustion gases into the boiler room.

The multiple fans operating at lower tip speeds also eliminate much of the noise and the high speed "whine" found where high speed turbines are used.

A very important advantage of Superior's *induced* draft system is in the evenness of its draw across all of the tubes in the fourth pass. This even distribution of the hot gases eliminates the danger of overworked or burnt out tubes and adds years to the life of the boiler.

Superior Steam Generators are built in 18 sizes from 20 to 600 b.h.p. for pressures to 250 p.s.i. burning oil or gas or both.

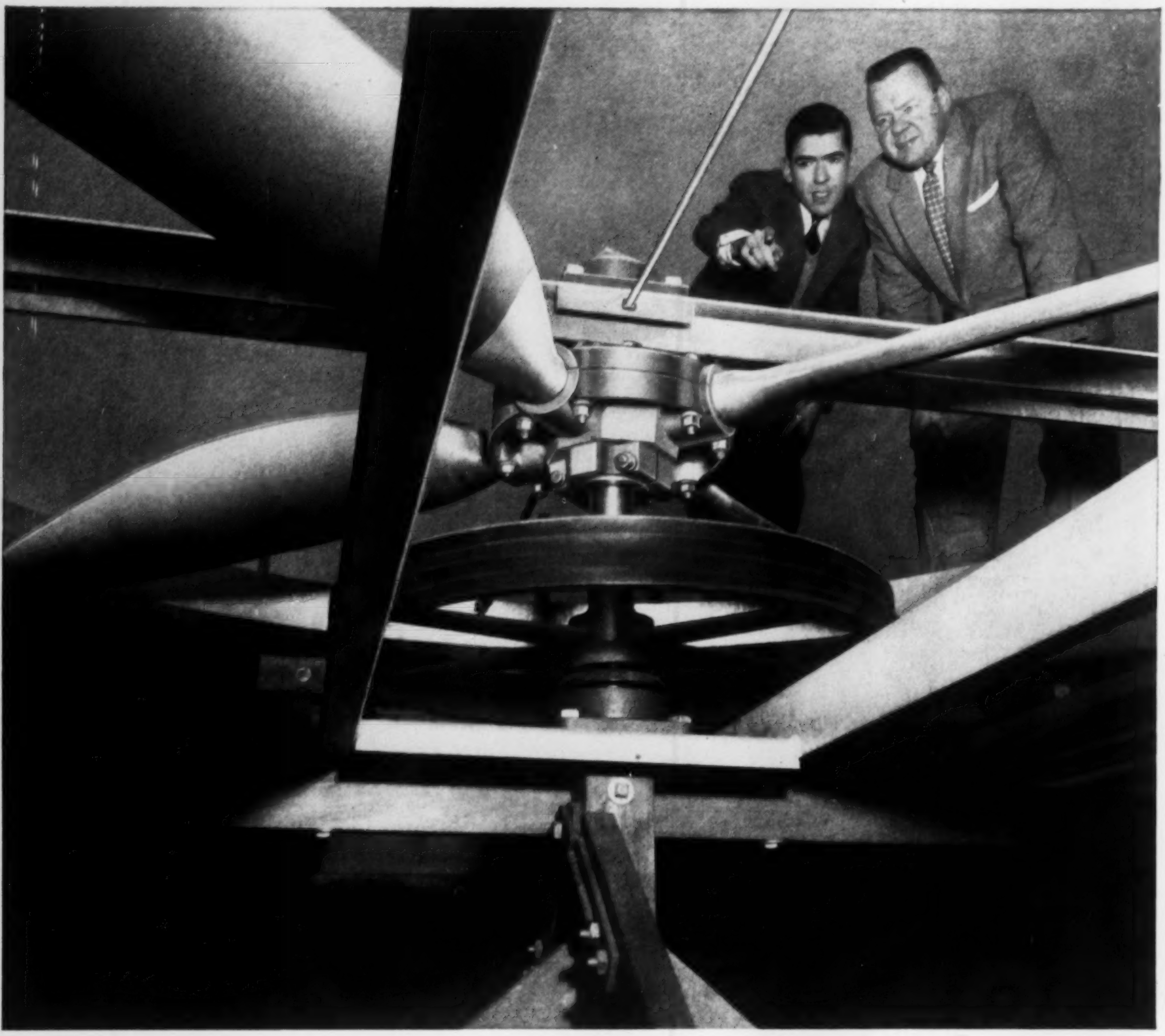
Write today for Catalog 804 F.

the most rugged and dependable
packaged fire tube boiler made . . .

for performance you can ***BANK*** *on*

SUPERIOR
STEAM GENERATORS

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.



"Take a look at the fan assembly on this LoLine Tower, Charlie."

"Looks rugged, doesn't it?"

"And it is. Yet the design is simple. About all there is to it is that heavy-duty fan wheel; those over-size bearings, the multi-V belt drive and that galvanized fan stack."

"Where's the motor?"

"Outside of the hot, moist air stream. No corrosion that way. Pritchard doesn't give rust a chance on the LoLine. Notice that the structural members supporting the fan assembly are hot-dip galvanized."

"But how about the fan shaft? Is it protected, too?"

"Stainless steel! And it has self-aligning bearings. See how those snap rings are used for positioning bearings! Speaking of the bearings—you grease these bearings from *outside* of the tower."

"Outside!"

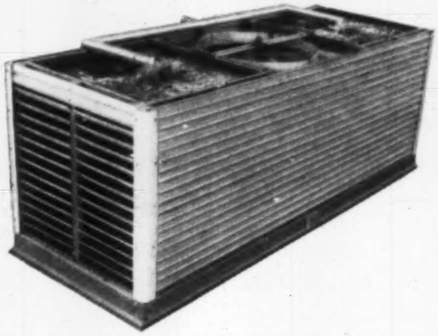
"Yes, see those copper tubes? They run from the grease fittings outside to the bearings. Makes lubrication much easier and a lot safer. Pritchard also makes available a speed reducer drive, if desired."

"No wonder you were so excited about this LoLine tower. Pritchard sure did go out of their way to make it a good one didn't they?"

J. F. PRITCHARD & CO. OF CALIFORNIA
4625 Roanoke Parkway, Kansas City 12, Mo.

"Take a look at the fan assembly on this LoLine tower, Charlie."

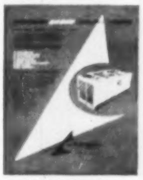
Pritchard LoLine® Is Lowest Silhouette Tower of 75 Tons Capacity and Up!



The Pritchard LoLine Cooling Tower is the lowest (7' 7 11/16" over-all) tower of 75 tons capacity and up now available. The LoLine incorporates many features in its design which are unique in low silhouette tower construction:

1. Galvanized steel fan drive supports and basin accessories.
2. Grease fittings for bearings on V-belt drive are outside tower.
3. Corrugated asbestos cement board casing.
4. Asbestos cement board louvers are standard, not special equipment.
5. Internal pipe supply system. Piping is completely concealed. (Optional.)
6. V-belt drive has stainless steel fan shaft.

GET ALL THE FACTS!



Write today on your company letterhead for your copy of the LoLine Bulletin 5.1.902. It gives complete details on this new, low silhouette tower. No cost or obligation, of course.

INDUSTRY'S PARTNER FOR PROGRESS

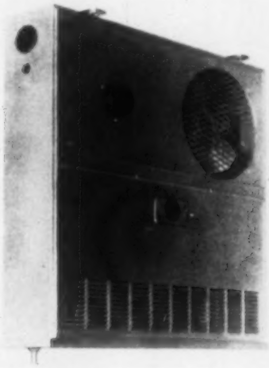
J.F. Pritchard & Co.
OF CALIFORNIA
A DIVISION OF J. F. PRITCHARD & CO.

Dept. 473, 4625 Roanoke Parkway
Kansas City 12, Mo.

COOLING TOWERS • GAS & AIR TREATING EQUIPMENT
REPRESENTATIVES IN PRINCIPAL CITIES FROM COAST TO COAST

EQUIPMENT DEVELOPMENTS

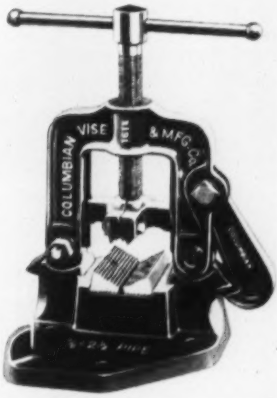
Continued



Mullion Unit . . .

. . . designed to occupy 20 percent less room space—*Tenney Engineering, Inc., Dept. HPAC, 1090 Springfield Rd., Union, N.J.*

Feature is two-way air flow system designed to distribute air for even, safe temperatures. Directional louvers control movement of low velocity air at outlet. In models 1850 to 2380 Btu, with one or two fans. Special types can be supplied to fit individual requirements, company reports.



Hinged Pipe Vise . . .

. . . designed for greater holding power, longer life—*Columbian Vise & Mfg. Co., Dept. HPAC, Cleveland.*

"Long Jaw" has reversible lower jaws, milled on both sides to provide double life. Jaws engineered to prevent crushing, scoring finish on pipe, thin wall tubing, etc. Vise also equipped with bender for small pipe. In four models with pipe capacity ranges 1/8-2 in. to 1/8-4 1/2 in.

UNMATCHED ACCURACY

in a package

Everything you need . . . for field instrumentation calibration

MERIAM Manometer Kits
- ★ Magnifying sight glass
- ★ Mirror for resolving parallax
- ★ Built-in level indicator
- ★ Precision-bore pyrex tubing
- ★ Built-in fluid seal
- ★ All stainless steel construction

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Meriam Manometer Instrumentation ...for pressures, vacuums, flows, liquid levels.

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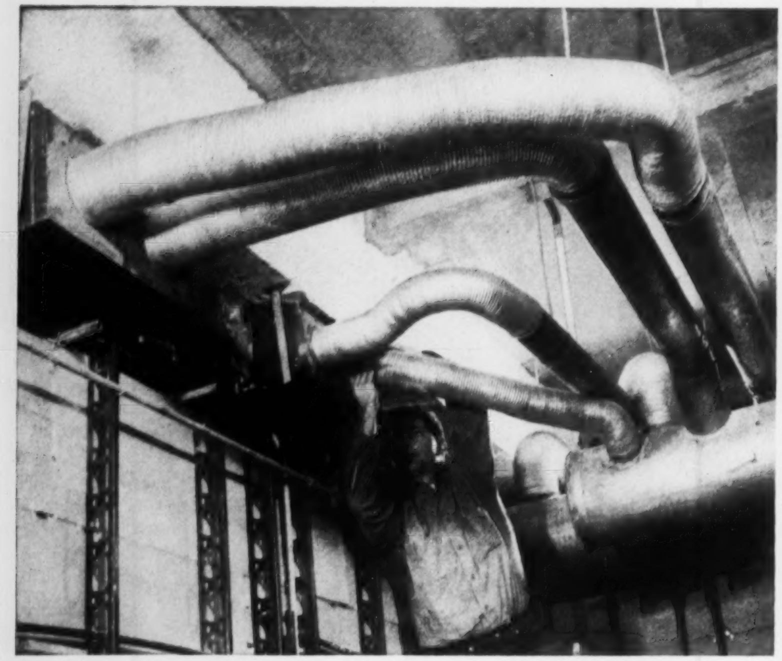
INSTRUMENT COMPANY
10920 Madison Ave. • Cleveland 2, Ohio

Thermaflex: flexible ducting

outperforms rigid ducting and installs faster at less cost



Whether it's a hot or cold air system, or both, you will find that you will save time and money when you use Thermaflex® high or low pressure flexible ducting as a connector to snake around bends and obstructions. You can forget about special elbows or costly connectors, for when you use Thermaflex one man, without special tools, can make the necessary connections in a matter of seconds.

You'll find, too, that Thermaflex is designed for the job. It is flameproof and waterproof and will give years of trouble-free service. Its use in a system reduces vibration and deadens air stream noises.

Thermaflex is engineered to provide excellent air flow characteristics and provides a minimum friction loss in bending around obstructions.

Write, today, for more information about this very useful product. Fill out the attached coupon and your information will be sent by return mail. Let us show you how you can save both time and money on your next air conditioning system.

Flexible Tubing
CORPORATION
GUILFORD, CONNECTICUT • LOS ANGELES 64, CALIFORNIA

Flexible Tubing Corporation, Dept. 7, Guilford, Connecticut
Please send me more information on Thermaflex.
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Title and Company__________
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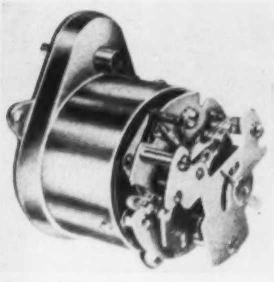
City__________ Zone_____ State_____

EQUIPMENT DEVELOPMENTS

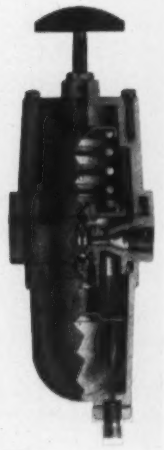
Continued



D-C Timing Motors . . .

. . . designed to provide accuracy of escapement clock, power of electric motor—*A. W. Haydon Co., Dept. HPAC, Waterbury, Conn.*

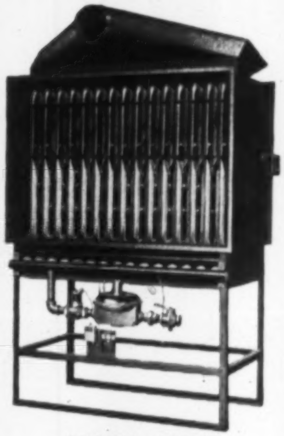
Units keep rate independent of load, line and temperature variations. Power pulses at full line voltage applied to small motor at intervals controlled by jewelled escapement, with pulse duration determined by travel of motor, company reports. Method is said to hold motor travel constant during each time interval regardless of load within rating. Recommended by company for service in automatic controls, timers, time delay relays, etc.



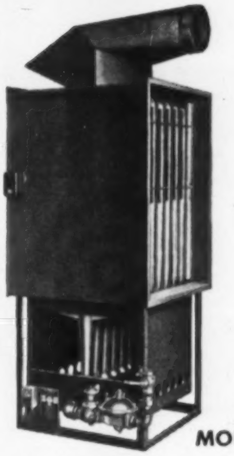
Air Regulator . . .

. . . designed to provide close regulation for instrument air supply in pneumatic instrumentation, other installations requiring high sensitivity of pressure output in small volumes of air, gas—*Black, Sivalls, & Bryson, Inc., Dept. HPAC, 7500 E. 12th St., Kansas City 26, Mo.*

Cited features for type "73-26" unit: higher air volumes, improved



MODEL SED-E

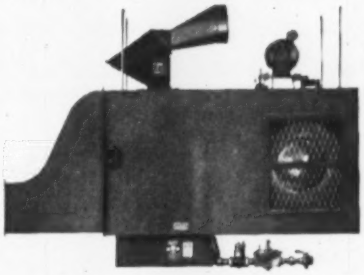


MODEL SED-S

MODEL SED-VF

MODEL SED-E — Non-corrosive type 321 stainless steel heat exchanger. Permits installation downstream of cooling equipment, for continuous blower operation. Air throughput in either direction. 80,000 to 600,000 Btu input.

MODEL SED-S — Same as SED-E except controls are at the side, instead of at the end where accessibility requires either SED-E or SED-S is available in sizes from 80,000 to 600,000 Btu input in increments of 40,000 Btu.



MODEL SEU

MODEL SED-VF — Tested and approved as a duct furnace; type 321 stainless steel. Re-circulated or fresh air enters through bottom, sides, or back. Built-in air bypass, vent in front. Sizes from 70,000 to 245,000 Btu input.

MODEL SEU — Suspended unit heater. Recirculates room air. Diffuser outlet with adjustable vertical and horizontal vanes. Double inlet forward curve blower. Continuous duty, variable pitch drives, raised port burners. 80,000 to 600,000 Btu input.

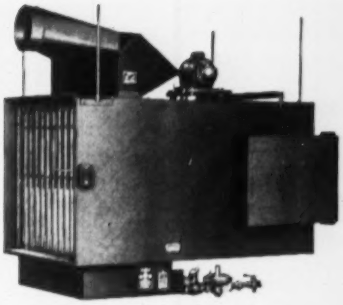
MODEL SEC

HAYES

FURNACES

outstanding for
commercial, industrial,
schools, churches,
theaters, large residential

HAYES FURNACE MFG. & SUPPLY CO.
3233 So. La Cienega Blvd., Los Angeles 16, California
Telephone TExas 0-3734



MODEL SES

MODEL SEC — Forced air furnace. Stainless steel heat exchanger sections seam and arc welded. One piece cast iron burners with drilled ports. Oversize double inlet blower, glass or washable filters. 6 sizes — 70,000 to 245,000 Btu input. For zero clearance.

REPRESENTATIVES

M. Blazer & Son, Passaic, New Jersey.
Blue Flame Supply Company, Atlanta, Georgia
Eugene Bolstad, Edmonton, Alberta, Canada.
E. B. Bomar, Phoenix, Arizona.
Boyd Engineering Co., El Paso, Texas.
Reube O. Emery, Nashville, Tennessee.
F & D Distributors, Salt Lake City, Utah.
Leudecke Engineering Co., Austin, Texas.
McCombs Supply Co., Denver, Colorado.
O'Connor-Oklahoma Co., Oklahoma City,
Tulsa, Oklahoma & Wichita, Kas.
Smith Steam Specialty Co., Kansas City, Mo.
Toy-Holbrook, Inc., San Francisco, California.
F. R. Young, Houston, Texas.
Dealers Supply Company, Atlanta, Georgia.
Jewell & Company, Hot Springs, Arkansas.
Nunn Electric Co., Lubbock, Texas.
Noland & Co., Newport News, Va.
Temp-Control Corp., Portland, Oregon

MODEL SES—Forced air, suspended furnace for installation in suspended duct system. Inlet and outlet designed for sheet metal duct connection. Double inlet forward curved blower. Continuous duty variable pitch drives, raised port burners.

"We've standardized on Janitrol . . .
400 units proved in long service"

AT REED ROLLER BIT CO., HOUSTON

says Mr. S. P. Robertson
Chief Industrial Engineer

"Janitrol heating equipment has been in use here at Reed Roller Bit Company for many years. Its satisfactory service record having been proved, we have for obvious reasons of efficiency and economy standardized on Janitrol throughout our expanding manufacturing facilities", states Mr. Robertson.

Reed Roller Bit now has over 400 units in year 'round use for heating in winter and ventilation in summer. The durability and performance of Janitrol in this and similar installations is again evidence of *proved* value in both equipment and installation.

Janitrol Unit Heaters are suspended over production area and directed to "spot" the heat just where required.

For more information on the use of unit heaters in many types of buildings write for your copy of "Businessman's Blue Book of Better Heating".

Janitrol
GAS-FIRED UNIT HEATERS

Janitrol Heating & Air Conditioning Division
Surface Combustion Corporation, Columbus 16, Ohio
In Canada: Alvar Simpson Ltd., Toronto 13

ALSO MAKERS OF Surface INDUSTRIAL FURNACES AND Kathabar HUMIDITY CONDITIONING

corrosion resistance, 40 micron phenolic impregnated cellulose filter. Connections are 1/4 in. pipe. Pressure capacities are 300 psig input, 40 psig output (100 psig with special spring).

Electrode . . .

. . .designed for mild steel welding requirements—*All-State Welding Alloys Co., Inc., Dept. HPAC, 249-55 Ferris Ave., White Plains, N.Y.*

Low amperage (40 to 225) deposits show tensile strength of 65,000 to 75,000 psi, yield strength of 58,000 to 63,000 psi, 26 to 34 percent elongation in 2 in., says company. For a-c or d-c welders. Recommended by company for fabrication of boilers, tanks, pressure piping, similar equipment. In 3/32, 1/8, 5/32, 3/16 in. core sizes.

Rotary Pumps . . .

. . .for corrosive solutions, abrasive slurries, fluids which must be kept free from contamination—*Vanton Pump & Equipment Corp., Dept. HPAC, 201 Sweetland Ave., Hillside, N.J.*

Constructed of stainless steel. Company's "flex-i-liner" principle of operation is said to eliminate need for stuffing boxes, shaft seals. Units available in capacities 1/3 to 20 gpm.

Dry air saves $40,000

XX
SUPER-XX
2-B

The Haloid Company, Rochester, N. Y., saves $40,000 a year by using Kathabar humidity conditioning equipment for drying photographic paper at low temperatures. Chemical dehumidification supplies air free of damaging moisture to the Haloid drying tunnel. This permits refrigeration to handle the sensible cooling load economically.

Haloid had previously dried the air for their tunnel dryer by over-cooling, then re-heating to required temperature. But now, with Kathabar equipment supplying air to the drying tunnels, they have eliminated tons of cooling, reheating costs, and frost. Haloid engineers estimate the total annual saving at $40,000.

Other film makers have found similar savings by using dry air in chilling and casting rooms.

Equally dramatic stories are repeated in many other applications of Kathabar equipment to low temperature drying. It will pay you to check the superiorities of Kathabar humidity conditioning.

write for the complete Haloid-Kathabar story today

Kathabar

HUMIDITY CONDITIONING

SURFACE COMBUSTION CORPORATION, TOLEDO 1, OHIO

FOR QUIET PERFORMANCE...

use Chicago Airfoil Fans

Its aerodynamically designed blades reduce noise level 65%, cut horse power requirements 35%. Capacities, 600 to 1,000,000 cfm.

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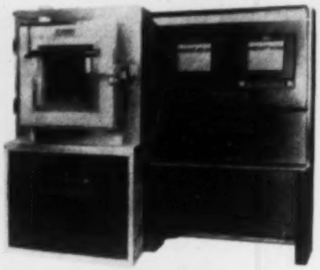
CHICAGO BLOWER CORP.

9869 Pacific Ave., Franklin Park, Ill.

See Phone Directory for Sales Offices

EQUIPMENT DEVELOPMENTS

Continued



Instrument Console . . .

. . . of environmental test equipment — *Tenney Engineering, Inc., Dept. HPAC, 1090 Springfield Rd., Union, N.J.*

Designed to localize switches, dials, contacts for easy control, accurate operation. Can be remoted for operations involving danger. Available in sizes, configurations to fit requirements of purchasers of environmental test equipment, company reports.

Lock Forming Machine . . .

. . . designed for greater output capacity — *Lockformer Co., Dept. HPAC, 4615 W. Roosevelt Rd., Chicago 50.*

Equipped with 2 hp, 220/440 volt, three-phase motor with matched double v belt drive, new "Super-Speed 20" is said to be capable of making Pittsburghs, other seams at 75 lineal fpm. Features pressure lubricated bearings, larger work table and guiding surface area.

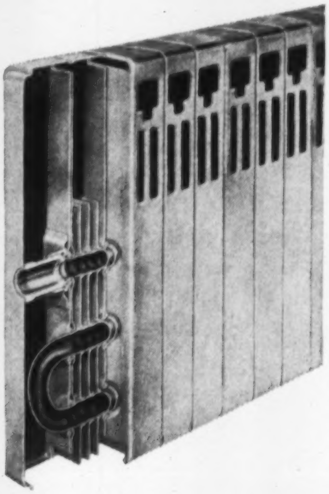
Thermometer . . .

. . . with temperature sensitive bulb, 6 ft of flexible capillary tubing — *Bacharach Industrial Instrument Co., Dept. HPAC, 7301 Penn Ave., Pittsburgh 8.*

Remote reading "Tempscribe" recording unit has pen operating

SHAW PANEL RADIATORS

are properly designed to distribute boiler heat in each room



Only Shaw Radiators are designed and constructed for proper room heat distribution. Their exclusive AIR-e-ATED Radiant Heat is a health-guarding, engineered combination of convected and radiant heat that only Nature — at her best — can duplicate.

Shaw Panel and Baseboard Radiators are self-contained, one-piece-bonded units just 3″ thick — easy to handle and install. Choice of tapping permits simplified piping, lower piping costs. Hot water or steam may be used up to 150 psi.

Write today for full information. And be sure to ask for your free copy of Shaw's new illustrated book, "Solving Modern Room Heat Distribution Problems."

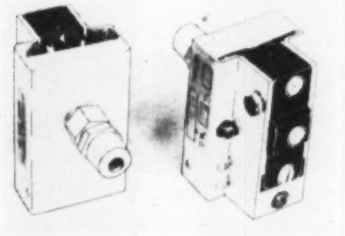
SP-8

MANUFACTURED BY
SHAW-PERKINS
201 EAST CARSON ST. • PITTSBURGH 19, PA.

EQUIPMENT DEVELOPMENTS

Continued

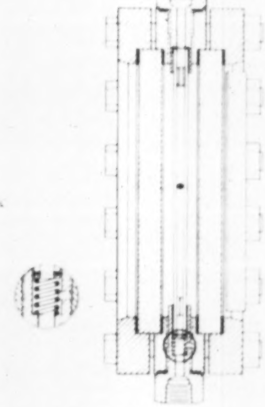
mechanism, to which capillary tubing is connected, housed in instrument's removable door. Two ranges for remote temperature recording available: —30 to 50 F, 10 to 90 F.



Low Pressure Switch . . .

. . .engineered for small physical size, high electrical ratings—*Henry G. Dietz Co., Dept. HPAC, 12-16 Astoria Blvd., Long Island City 2, N.Y.*

Occupies little over 5 ½ cu in., has rating of 15 amperes at 120-250 volts, a-c. Is designed to operate on static pressure of 1.5 in. WC or more. Required operating pressure adjusted at factory to purchaser's specifications. Cited applications are in packaged steam plants, air conditioning where unit may be used to operate defrosting equipment.



Rotameter Kit . . .

. . .for laboratory, pilot plant, field testing—*Brooks Rotameter Co., Dept. HPAC, Lansdale, Pa.*

For service to 3000 psi at 200 F. Kit features equalizing vent designed for use of glass metering tubes at elevated pressures without fear of tube

New pump

Engineered for top efficiency!

Works well in any position!

IT'S THE NEW INGERSOLL-RAND

MOTOR PUMP

FOR AIR CONDITIONING

Air conditioning systems are most dependable when you've specified this new 1¼ KRVSA MOTORPUMP—now available in 1, 1½, 2, 3 horsepower sizes!

- More compact—saves space.
- More efficient operation lowers costs.
- I-R advanced engineering and modern construction makes them even more dependable.

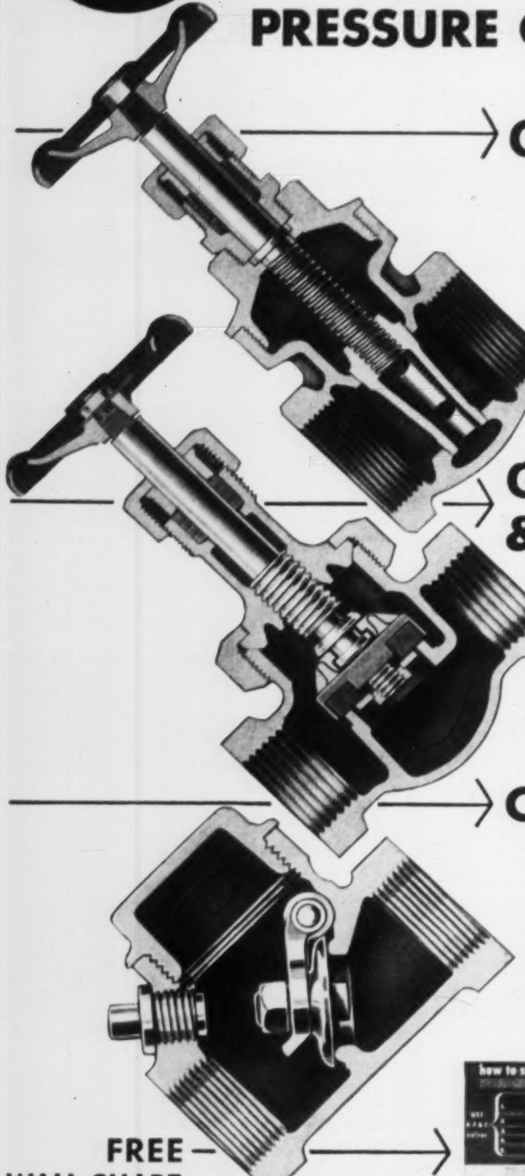
Ingersoll-Rand MOTORPUMPS are also ideal for other liquid handling jobs. Latest I-R MOTORPUMP bulletin describes the full line from ¼ through 75 horsepower. Write for one today.

Ingersoll-Rand

9-297 11 Broadway, New York 4, N. Y.

ACCO products

R-P&C BRONZE VALVES—125, 150, 200 AND 300 LB. PRESSURE CLASSES



GATES

Fig. 86 illustrated, rated for 125 lbs., steam, 200 OWG, has stationary stem, solid wedge, screwed ends. Other 125 lb. models with screwed bonnet, rising stem, solid or split wedge.

GLOBES & ANGLES

Fig. 1A Globe illustrated, rated 150 lbs. steam, 300 OWG, has renewable asbestos disc, union bonnet. Also furnished as Angle. Sizes ⅛" to 3".

CHECKS

Fig. 198 illustrated, rated for 125 lbs. steam, 200 OWG. Other swing check valves in 150, 200, 300 lb. classes.

"Reliable Protection & Control"

how to select valves
1
2
3
4
5

FREE—WALL CHART
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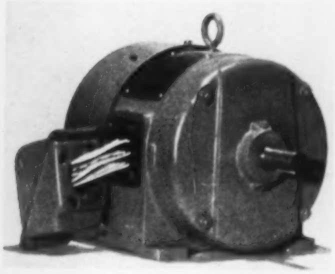
ACCO

R-P&C Valve Division
AMERICAN CHAIN & CABLE

Reading, Pa., Atlanta, Boston, Chicago, Denver, Detroit,
Houston, New York, Philadelphia, Pittsburgh, San Francisco,
Bridgeport, Conn.

Better Values

rupture. "Hi-Pressure" kit includes four "Tru-Taper" metering tubes, 19 "Accura-Density" spherical floats to cover wide flow range.



Motors . . .

. . . in two new lines in 1 to 5 hp range—*General Electric Co., Dept. HPAC, Schenectady 5, N.Y.*

Enclosed, nonventilated, fan cooled lines designated "standard enclosed" and "severe duty enclosed." Standard enclosed unit features steel conduit box, fan cover. Conduit box has "keyhole" mounting for quick installation. Mounting screws need not be removed, says company. Severe duty line is basically same as standard except for features making it suitable for use in corrosive or moist atmospheres, company reports.

Shaft Collars . . .

. . . in 44 bore sizes 3/16 to 3 in. in 1/16 in. increments—*Climax Metal Products Co., Dept. HPAC, 863 E. 140th St., Cleveland 10.*

Designed to hold shafts mounted on plain bearings in position, eliminating "floating." Sizes to 2 in. machined from cold rolled steel with cadmium finish. Larger sizes are cast iron with machinery gray lacquer finish. Collars shipped with set screws assembled.

Who's handling public relations for you behind the Iron Curtain?

It's not an easy assignment—or the kind you'll find many people volunteering for.

But there *is* an important "public relations" job to be done behind the Iron Curtain—for you . . . for America . . . for the whole concept of freedom, free enterprise and individual rights. This job is an opportunity and a challenge as well as a serious responsibility for American business. Fortunately, with your help, there *is* an agency that can do the job—*Crusade for Freedom*, which supports Radio Free Europe and Free Europe Press.

Both these powerful, privately operated organizations continually challenge the barrage of Communist misstatements and false truths. Using saturation radio broadcasts and mass newspaper drops from message balloons, Radio Free Europe and Free Europe Press are constantly on the offensive against the Red campaign to annihilate right, reason and national pride.

Continued and heated Communist protests testify to the tremendous effectiveness of Radio Free Europe and Free Europe Press. Support freely given by free American business and private citizens will increase this effectiveness and the scope of their operations. A contribution now is perhaps the best investment you can make towards a peaceful, prosperous world.

Give generously. It's your future!

Check list for business executives
in the Crusade for Freedom

☐ Order display material for your company bulletin board.

☐ Plan a paycheck stuffer to fully acquaint your employees with the importance of the Crusade for Freedom.

☐ Plan to conduct an in-company solicitation.

☐ Match employee funds with *your Truth Dollars*.

PUBLIC SERVICE ADVERTISING COUNCIL

For campaign material and information write **CRUSADE FOR FREEDOM,** 345 East 46th St., N. Y. C. 17.

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- PROCESSING
- AIR CONDITIONING

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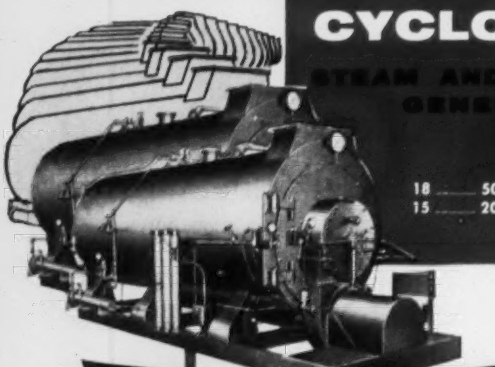
STEAM AND HOT WATER GENERATORS

18 ...... 500 hp.
15 ...... 200 psi.



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Sastified users say "Cyclotherm Steam and Hot Water Generators will meet your requirements under the most exacting steam demands and rugged operating conditions . . . in a variety of climates and elevations."

Thousands of enthusiastic owners are the finest assurance any boiler manufacturer can offer potential customers. Cyclotherm has this assurance and one of the best re-order records in the steam generator industry.

Owners are enthusiastic because Cyclotherm offers them:

1. ***Exclusive Cyclotherm Cyclonic Combustion*** **. . . unequalled by any other combustion method in efficiency and economy.**
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5. ***Reduced installation costs*** **. . . only 5 connections necessary.**
6. ***Factory-trained Service Engineers*** **. . . available weekdays and weekends.**

WRITE TODAY for your free copy of the illustrated, informative booklet with all of the advanced space—time—and cost-saving features of Cyclotherm Steam and Hot Water Generators. Join the thousands of cost-wise, efficiency-minded buyers who order Cyclotherm whenever steam is required.

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YEARS AHEAD IN STEAM GENERATION
CYCLOTHERM
STEAM AND HOT WATER GENERATORS

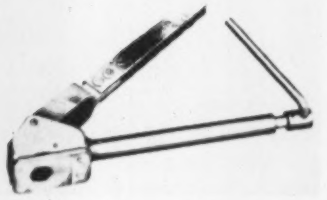
EQUIPMENT DEVELOPMENTS

Continued

Strainers, Air Eliminators . .

. . . for use with liquid meters—*Rockwell Mfg. Co., Meter and Valve Div., Dept. HPAC, 400 N. Lexington Ave., Pittsburgh 8.*

Engineered for "straight through" flow, ruggedness, versatility. Cited advantages of strainers are larger screening area, double gasket construction to protect inner screen. Available in in-line, angle models. Features of air eliminators are easy access to working parts, in-line outlet and inlet connections, says company. In 2 in. screw models; 3, 4, 6 in. flanged models.



Weld Tip Remover . . .

. . . designed for efficiency—*Miller Electric Mfg. Co., Inc., Dept. HPAC, Appleton, Wis.*

"Ejecto Tip Puller" tightens over tip by means of small high leverage crank. Easy pressure on handles withdraws tip quickly, without damage to tip or horn, says company.

Air Conditioners . . .

. . in ¾ to 2 hp models, for window installation—*McGraw Electric Co., Lonergan Mfg. Div., Dept. HPAC, 704 N. Clark St., Albion, Mich.*

"Super" line in ¾, 1 hp models. "Custom" line in ¾, 1, 2 hp units. "Coolerator" 2 hp unit is said to cool rooms to 1010 sq ft. All units have four directional "no draft" grilles.

Self Sealing Coupling . . .

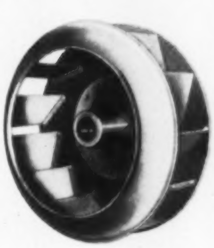
. . designed for use with fluorinated hydrocarbon refrigerants (Nos. 12 and 22)—*Aeroquip Corp., Dept. HPAC, 300 S. East Ave., Jackson, Mich.*

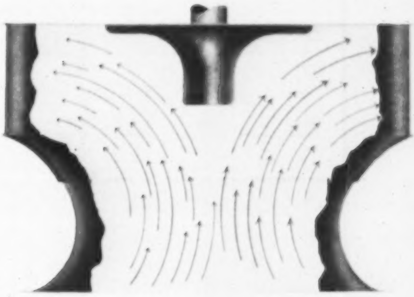
Available in sizes ¼ to 1½ in., is said to provide positive, leakproof seal, without inclusion of air upon disconnection or connection.

The MASSACHUSETTS *Line*®

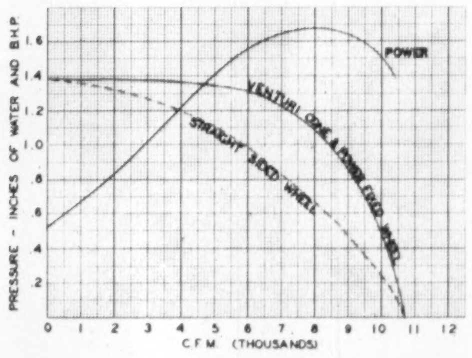
POWER ROOF VENTILATORS* (POWER FIXED TYPE)

*IMPROVED DESIGN





The above diagram illustrates air flow through the streamlined inlet cone section and spun wheel cone of MASSACHUSETTS Power Roof Ventilators. Note the overlap of wheel and inlet cone, allowing no loss of air and efficiency at this point, and no turbulance. LOOK FOR THIS FEATURE when buying or specifying Power Roof Ventilators.

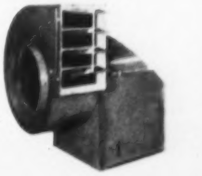


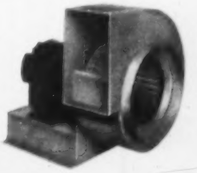
Test conducted in Bishop & Babcock Laboratory on a 30 inch Centrifugal Power Roof Ventilator at 685 R.P.M. Solid line represents Massachusetts design employing full venturi inlet cone and Power Fixed or spun cone type wheel. Dotted line represents air delivery of unit employing a straight sided wheel and short inlet cone.

Write for Catalog Bulletin No. 124 for complete data on 13 sizes, belt driven, 15" to 59½" and direct driven type.

UTILITY TYPE VENTILATING SETS

Both belt drive and direct drive available in popular competitive sizes, self-contained completely packaged units. Write for Catalog Bulletin No. 109.

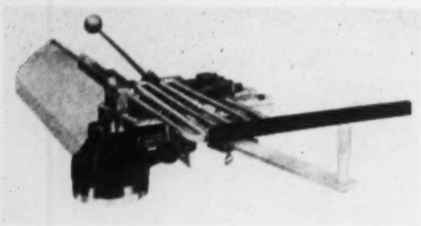




MASSACHUSETTS BLOWER DIVISION

The BISHOP & BABCOCK Mfg. Co.

4901 HAMILTON AVENUE CLEVELAND 14, OHIO



Coil Bender . . .

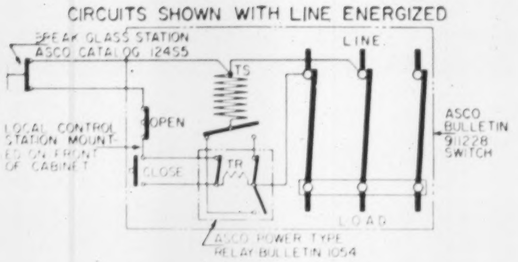
. . . designed to produce continuous serpentine coils from single length of tubing, without removing tubing from machine—*Leonard Precision Products Co., Dept. HPAC, 9200 Bolsa Ave., Santa Ana, Calif.*

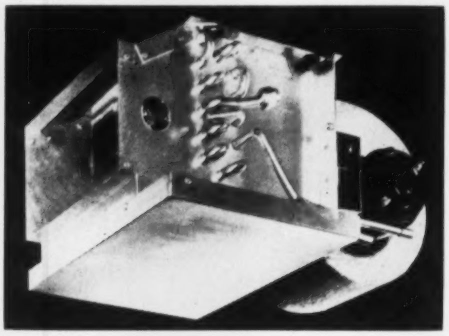
No welding required. "Coil-Master bends annealed ferrous, nonferrous tubing ¼ to 1 in. OD, says company. Is said to be easily adaptable to all standard bending.

Remote Control Switch . . .

. . . for oil burner panels—*Automatic Switch Co., Dept. HPAC, 391 Lakeside Ave., Orange, N.J.*

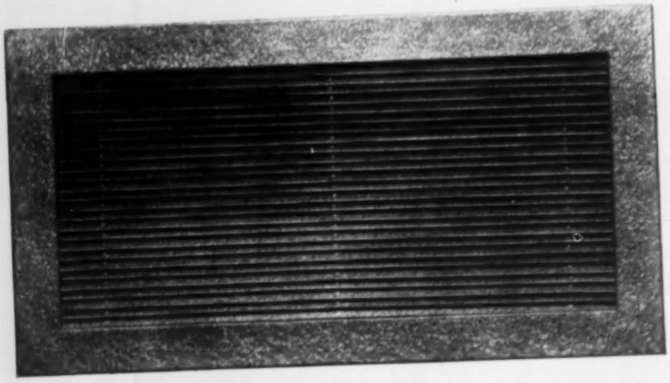
Arranged to disconnect power supply from oil burner circuits automatically, upon operation of break glass type station through relay holding circuit. Basic components include: mechanically held three-pole remote control switch, heavy duty power relay, separately mounted oil burner break glass switch, momentary contact pushbutton station with one normally open and one normally closed contact.


CIRCUITS SHOWN WITH LINE ENERGIZED
BREAK GLASS STATION
ASCO CATALOG 12455
LINE
TS
OPEN
LOCAL CONTROL STATION MOUNTED ON FRONT OF CABINET
CLOSE
TR
ASCO BULLETIN 911228 SWITCH
LOAD
ASCO POWER TYPE RELAY BULLETIN 1054



Transom Air Conditioner . . .

. . . designed for quiet performance for cooling, heating hotel rooms, motels, offices, hospitals, apartments,



- CUTS INSTALLATION TIME OVER ½!
- EASY TO INSTALL *Anyone Can Do It!*
- COMPLETE—NO WOOD MOLDINGS TO ADD!

NEW! **THIN CORE GRILLE FOR DOORS – PARTITIONS ¼" to ¾" THICK!**

First Grille ever designed specifically for thin doors and partitions. Anyone can install it in just a few minutes time. No close tolerances required . . . almost a half-inch extra on sides for positioning. Telescoping auxiliary frame fastens to grille with posts and screws. Clamps tight. No holes to position. Practically no danger of ruining door. No wood moldings. All steel. Rattle-proof. No vision, with 80% free area. Available with or without frame, all sizes. Gray or tan prime coated, or Hammertone finish in gray or bronze.

→ ACTUAL SIZE Cross Section

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Listing Over 1000 Types and Sizes of Grilles for Every Requirement

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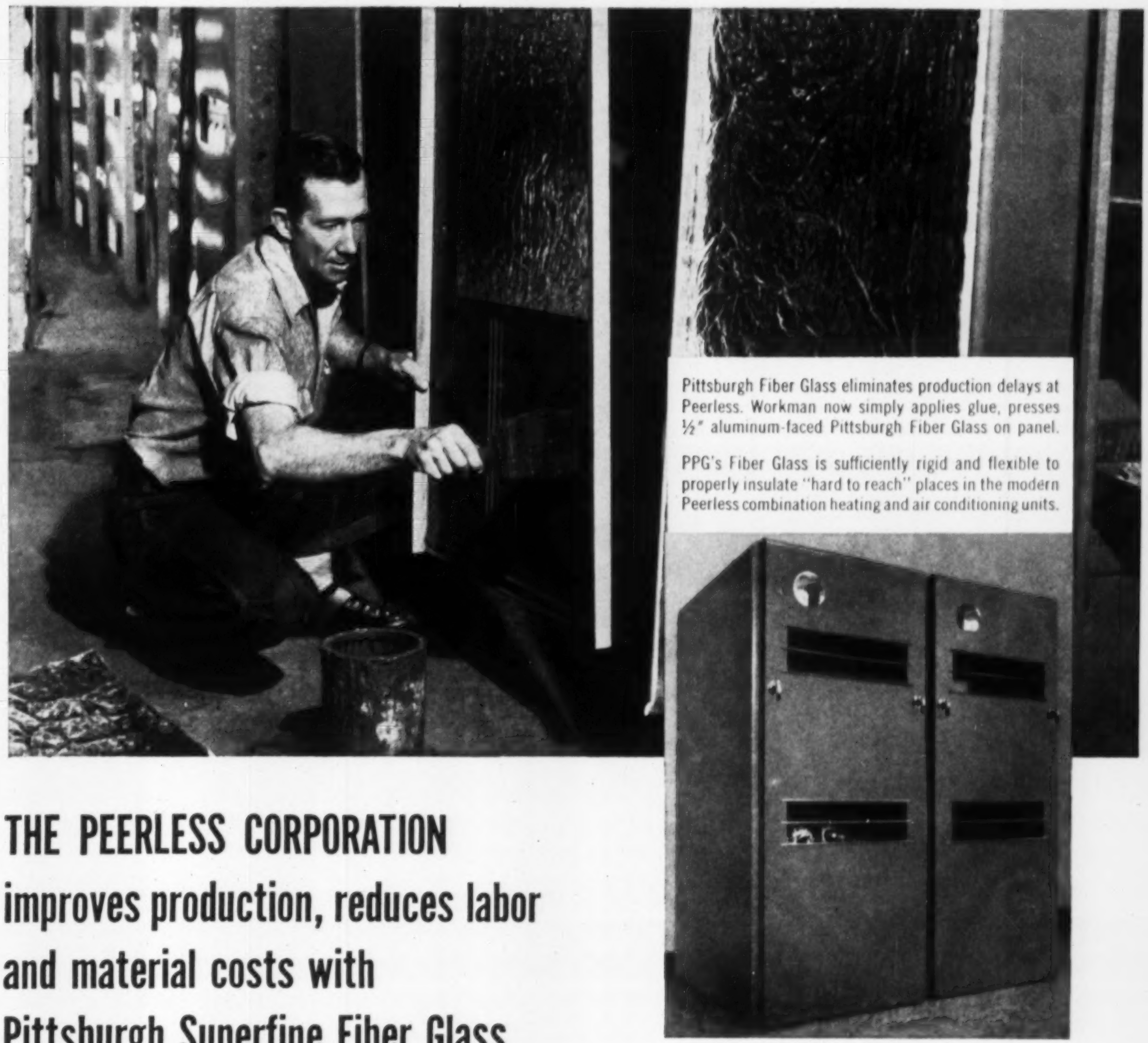
Dept. H-3 - 3601 E. 18th Street - Kansas City 27, Mo.



Pittsburgh Fiber Glass eliminates production delays at Peerless. Workman now simply applies glue, presses ½" aluminum-faced Pittsburgh Fiber Glass on panel.

PPG's Fiber Glass is sufficiently rigid and flexible to properly insulate "hard to reach" places in the modern Peerless combination heating and air conditioning units.

THE PEERLESS CORPORATION improves production, reduces labor and material costs with Pittsburgh Superfine Fiber Glass

Improved insulation quality and lower manufacturing costs? Those are the two important advantages The Peerless Corporation of Indianapolis, Indiana, gained for their complete line of coal, oil and gas-fired home furnaces and air conditioning units when they switched to Pittsburgh Superfine Fiber Glass insulation two years ago.

"Pittsburgh Fiber Glass improved our production efficiency, reduced material and labor costs, completely eliminated one manufacturing operation," says M. T. Cunningham, Plant Foreman.

"Superior insulating value, increased flexibility, consistency and dependability of Pittsburgh Fiber Glass has bettered the quality of our units, reduced paint failure, improved safety and made possible the insulation of sharp corners and hard-to-get-to places," states Mr. Frank Mutz, President of Peerless.

Are you completely aware of the many profitable benefits that Pittsburgh Superfine Fiber Glass can bring to your insulation requirements? If you manufacture or install furnaces, air conditioners or related ductwork, get the facts now. For general information, write for Bulletins F-100, F-185 and F-190, to Fiber Glass Division, Pittsburgh Plate Glass Company, One Gateway Center, Pittsburgh 22, Pennsylvania. For fast service on your specific problems, call the nearest Fiber Glass Division sales office listed here.

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Every RIDGID Pipe Tool TESTED individually before shipment

This is it...

the fast efficient
all-in-one
pipe and bolt threader
... threads, cuts, reams!

New
RIDGID
500A with SPEED CHUCK
... most clean cuts and
threads with least work

Capacity: 1/8" to 2" pipe; 1/4" to 2" bolts or rod.

New type wrenchless Speed Chuck operates easily, quickly, guaranteed to grip pipe or rod tightly—forward, reverse; jaws have replaceable insert teeth for longer life . . . Independent die heads, cutter, reamer swing up out of way when not in use . . . Quick-opening die heads—1 Quadri and 2 Dual heads for 1/4" to 2" (1/8" available) . . . quick size change right in machine . . . Power for geared tools to 12". Many other efficient worksaver features. See it, try it . . . buy it—at your Supply House.

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RIDGID
Work-Saver Pipe Tools

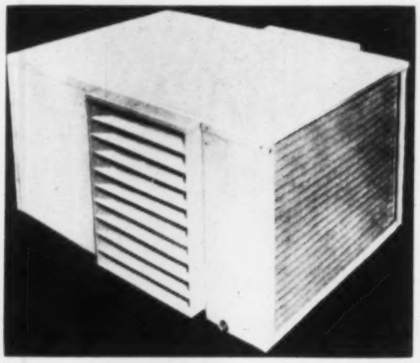
"Threaded Pipe—It's Tight—It's Best—Costs Less"
The Ridge Tool Company, Elyria, Ohio, U.S.A.

EQUIPMENT DEVELOPMENTS

Continued

other multiroom units—*Refrigeration Appliances, Inc., Dept. HPAC, 903 W. Lake St., Chicago 7.*

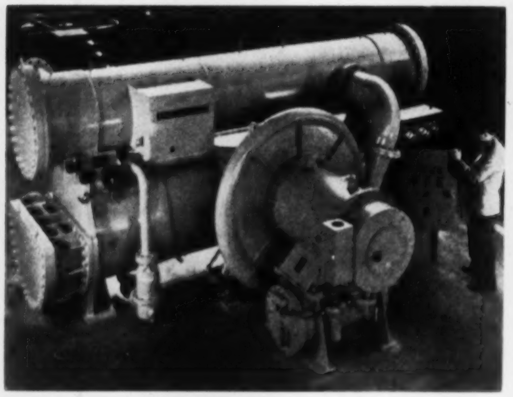
Two models engineered for direct expansion, chilled water, hot water applications. Optional three-speed fan control provides comfort, economy of operation under wide range of conditions, says company. Direct drive centrifugal fans designed for quiet, efficient air conditioning. Units move 410 and 580 cfm of air. Cooling capacities are 10,100 and 14,100 Btu per hr, direct expansion; 14,900 and 22,600 Btu per hr, chilled water. Heating capacities are 21,600 and 38,000 Btu per hr.



Compressor-Condenser Units . . .

. . . for remote air conditioning—*Lennox Industries, Inc., Dept. HPAC, Marshalltown, Ia.*

"Stowaway" units designed for efficient and economical cooling, quiet performance, long life, easy maintenance, compactness. With 7 1/2 ton capacity. Powered by 3/4 hp motor. Recommended by company for small commercial installations.



Refrigerating Machine . . .

. . . engineered for quiet, efficient performance—*American Blower Corp., Dept. HPAC, Detroit 32.*

Single-stage hermetic centrifugal type. "Tonrac" features automatic chilled water temperature control throughout range of cooling capacity. In sizes 240 to

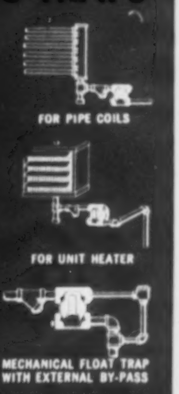
STOP STEAM WASTE... *these 3 Ways*

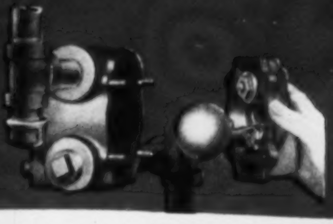
FLOAT and FLOAT & THERMOSTATIC TRAPS

Again Hoffman provides industry with an improved product, refined to *function more effectively and economically in removing condensate.*

Hoffman engineers thus anticipate industrial steam heating trends that demand less maintenance and operating costs.

The new 50 Series Float and Thermostatic Trap has an integral thermostatic air by-pass consisting of thermal element, seat, and cage, factory set and sealed assuring dependable service and easy maintenance.





The cover construction of Hoffman F&T Traps is so designed that all working parts of the Trap are readily accessible — no pipe connections to break.

INVERTED BUCKET TRAPS

FOR STEAM SERVICE

HOFFMAN
SPECIALTY COMPANY
INDIANAPOLIS, IND.
IN
OUT

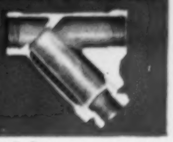
Hoffman Bucket Traps operate intermittently and are particularly applicable to draining condensate and air from steam lines or equipment where large quantities of air and condensate must be discharged. They are easily inspected, cleaned and serviced by merely removing the cover assembly.

RADIATOR THERMOSTATIC TRAPS

LOW, MEDIUM AND HIGH PRESSURE

Highly sensitive thermostat. Non-corrosive pin and seat. Thermostat and seat are renewable. Protective brass cage around thermostat. Brass body, cap, nipple and nut. The combination of these features in Hoffman Traps gives maximum efficiency and reduces maintenance and operating costs.

No. 400 DIRT STRAINER



Protects seating surfaces of traps, pressure reducing valves, temperature and pressure control valves, self cleaning.

Illustrated catalog pages on Hoffman F & T Traps, Inverted Bucket Traps and Radiator Traps will be gladly furnished, free on request.

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HOFFMAN SPECIALTY MFG. CORP.
VALVES, TRAPS, VACUUM AND CONDENSATION PUMPS, FORCED HOT WATER HEATING SYSTEMS

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THE NAME
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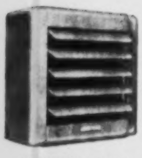
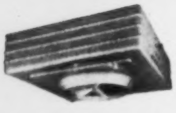
UNIT HEATERS

Nesbitt
INDUSTRIAL UNIT HEATERS


PROPELLER FAN
UNIT HEATERS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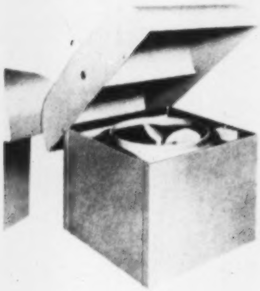
UNIT HEATERS

SERIES C
UNIT HEATERS

GAS FIRED
UNIT HEATERS

Made and sold by John J. Nesbitt, Inc., Philadelphia 36, Pa. Offices in principal cities

410 tons. Motor ratings are 250 and 300 hp. Hermetic motors available for 208, 220, 240, 440, 460, 480, 550 volts; three-phase, 60 cycles, three-wire and two-phase, 60 cycles, four-wire current. Reduced voltage starting equipment required.



Roof Ventilator . . .

. . . with fans 12 to 18 in. capacities 640 to 22,000 cfm—*Peerless Electric Co., Dept. HPAC, 1401 W. Market St., Warren, Ohio.*

Designed to be weatherproof, low in silhouette. Recommended by company for exhaust duty on commercial, industrial buildings. Discharges air in downward direction. Shutters mounted at bottom of unit to protect against rain, snow. Automatic or motor driven shutters furnished as specified.

Pipe Wrap . . .

. . . with underwrap of glass fiber insulation, outerwrap of vapor sealing tape—*Rhopac, Inc., Dept. HPAC, 3425 Cleveland St., Skokie, Ill.*

"Easy Wrap" is said to prevent condensation, sweating of cold water pipes; provide efficient insulation for

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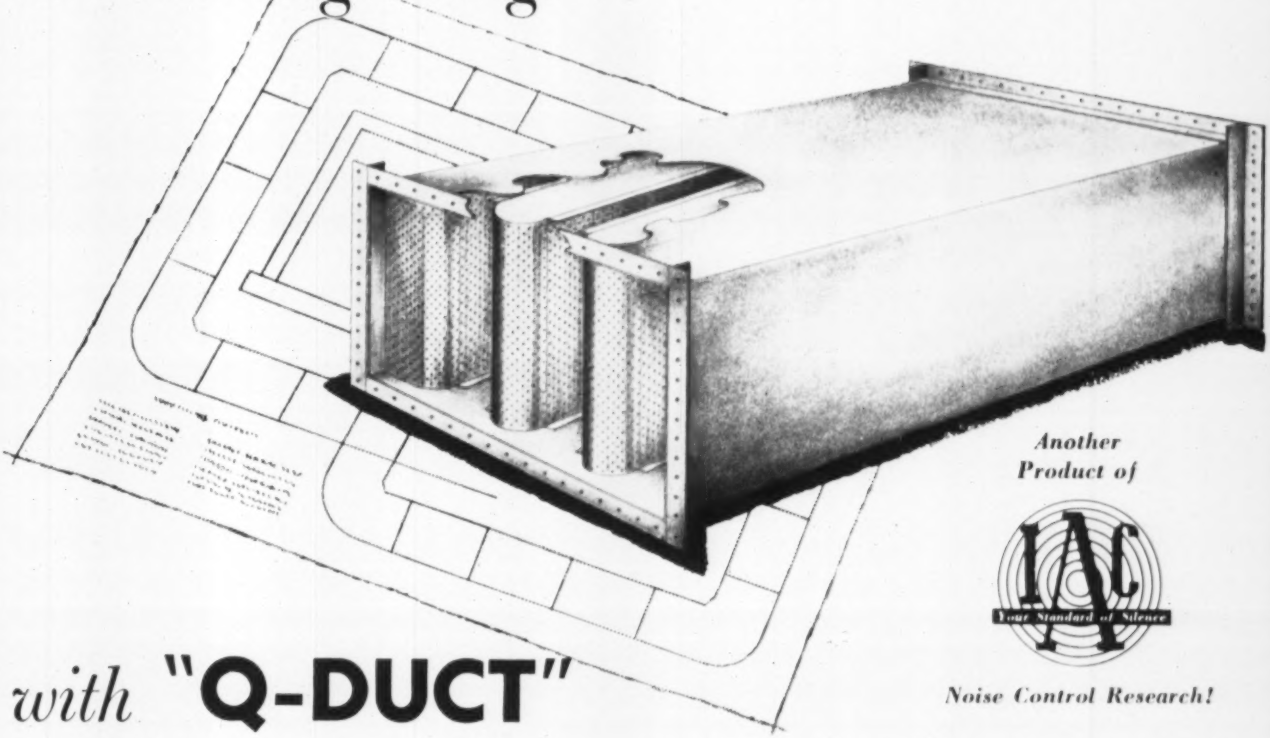

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Your Standard of Silence

Noise Control Research!

with "Q-DUCT"

PACKAGED STANDARDIZED SILENCING

Yes, the revolutionary, new "Q-DUCT" Air Conditioning Silencing System makes it possible for you to eliminate duct noises before any ventilating system is built or installed, or in existing systems. Through the use of handy "Q-DUCT" data sheets, you can determine the right prefabricated "Q-DUCT" unit to be fitted into the system during the design stage of the installation. Standardized "Q-DUCTS" are available in *148* sizes to meet every dimension and performance requirement!

Valuable territories available for qualified manufacturers' representatives.

PROVEN PERFORMANCE!

Determined from actual air-flow measurements "Q-DUCT" units measuring in length from 2 to 10 feet provide as much noise control as a conventional lined duct measuring from 30 to 100 feet long!

FREE DATA AVAILABLE!

Send coupon today for a complete set of "Q-DUCT" data sheets and catalog describing the "Q-DUCT" Silencing System!

INDUSTRIAL ACOUSTICS COMPANY, INC.

"Specialists in Noise & Pulsation Control — Mfrs. of Engineered Acoustical Products for Industry"

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Industrial Acoustics Co., Inc.
341 Jackson Ave., New York 54, N. Y.

Please send catalog and full details of the "Q-DUCT" Silencing System.

Name ....
Firm Name ....
Address ....
City .... **Zone** .... **State** ....

FOR WATER LINE CONTROL...
Remember
rust and scale won't clog or jam
THIS
J-E
SOLENOID VALVE!

Even *dirty* water doesn't bother this J-E Solenoid Valve. There is no place for foreign matter to cause trouble . . . no metal-to-metal contact . . . just two moving parts (a stainless steel plunger and a flexible diaphragm). The flexible synthetic diaphragm literally "shrugs" off rust and scale . . . and is *free floating* to give you better flow with less pressure drop.

For all kinds of fluid control, J-E Solenoids *guarantee* you:

QUIET OPERATION . . . no mechanical linkage or impact action

DEPENDABILITY . . . tight seating, yet no chance for jamming or clogging

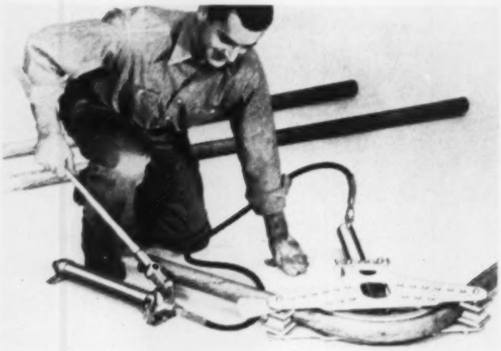
EASY MAINTENANCE . . . only two moving parts . . . cool-operating coils . . . one size coil and one plunger fit all valves

SIMPLE INSTALLATION...can be installed in any position.

CALL YOUR WHOLESALER . . .
or write us today!

JACKES-EVANS MANUFACTURING CO.
4 27 Geraldine Avenue • St. Louis 15, Mo.

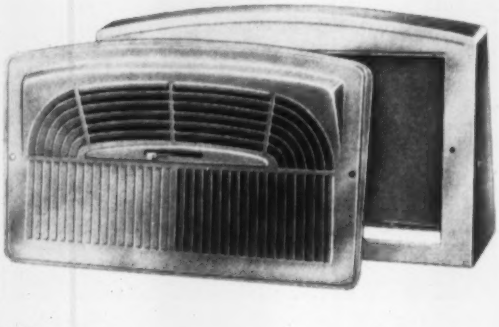
hot water pipes, preventing cooling of water in pipes and fuel waste. Also provides high degree of protection against freezing, says company. Available in bulk for commercial use.



Hydraulic Pipe Bender . . .

. . . designed for bends to 90 deg in one setting of pipe, one stroke of ram—*Blackhawk Mfg. Co., Dept. HPAC, 5325 W. Rogers St., Milwaukee 46.*

Model "S-130" has bending frame, swivel, bending shoes of aluminum. Cited feature is removable top plate designed to permit easy setting of shoes, positioning of pipe for bending. "Optik Angle Gage" permits operator to have visual control of progress of bend with every pump stroke, says company. Six bending shoes handle ½, ¾, 1, 1¼, 1½, 2 in. diameter pipe or conduit.



Diffuser . . .

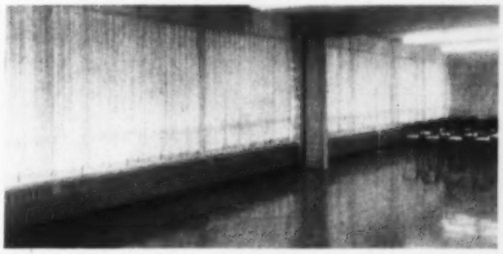
. . . for out-of-the-wall installation—*Air Control Products, Inc., Dept. HPAC, Coopersville, Mich.*

Designed for applications where stackhead, duct cannot be put in wall. Economical to install on concrete, cinder block applications, or types of old construction requiring remodeling, says company. Back section of unit fits against wall, with precut hole in bottom. Diffuser screws to front. In two sizes, 10 x 6 in., 12 x 6 in.

The answer to *LARGE AREA HEATING...*

KRITZER

STB Slope Top Radiant Baseboard



KRITZER STB (Slope Top) is a high capacity baseboard used in schools, hospitals, institutions, and other large area heating applications. It is made of heavy gauge steel, die-formed with safe rounded edges to withstand the knocks and bumps of everyday use.

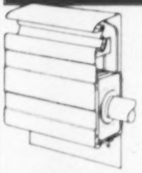
Clean lines and attractive appearance make KRITZER STB at home in any interior . . . institutional, commercial, industrial.

Performance is assured . . . KRITZER coils, with covers, are thoroughly tested in the industry's most modern research laboratory. Ratings are Certified. All products guaranteed for materials and workmanship.

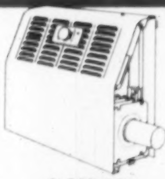
KRITZER is the world's largest *exclusive* manufacturer of radiant baseboard. Buy Kritzer. Get the latest . . . Get the best!

KRITZER RADIANT COILS, INC. 2901 Lawrence Ave., Chicago 25.

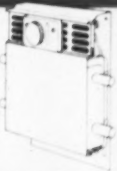
KRITZER QUALITY HEATING PRODUCTS



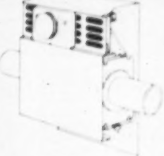
"K" LINE BASEBOARD



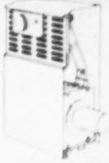
SLOPE TOP BASEBOARD



STANDARD BASEBOARD



UNIVERSAL BASEBOARD



CONVECTOR, SLOTTED FRONT

KRITZER FINNED TUBE

KRITZER

REPRESENTATIVES IN PRINCIPAL CITIES
SEE YOUR JOBBER FOR KRITZER PRODUCTS

"IF IT'S KRITZER, IT'S RIGHT, SIR!"

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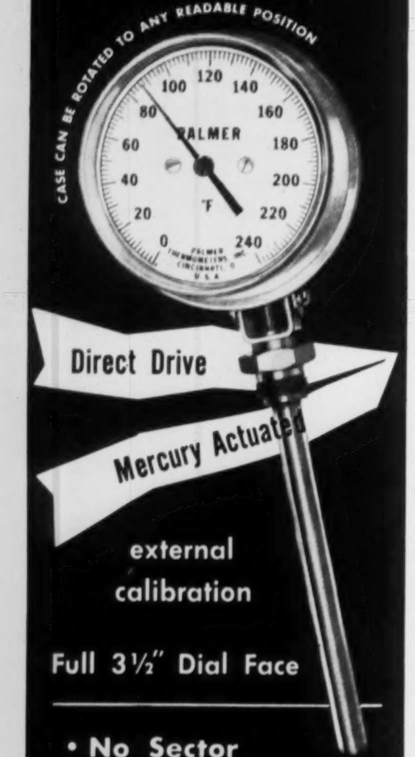
presents
an outstanding
improvement in
DIAL THERMOMETERS



external
calibration

Full 3½" Dial Face

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- No Pinion
- No Linkage
- Constant Accuracy
- Easy Readability

WRITE FOR BULLETIN 350

PALMER
THERMOMETERS, INC.
Norwood Ave., Cincinnati 12, Ohio
Mfrs. of Industrial Laboratory Recording
and Dial Thermometers

EQUIPMENT DEVELOPMENTS
Continued

Synthetic Hose . . .

. . . for use at elevated temperatures—*Quaker Rubber Div., H.K. Porter Co., Inc., Dept. HPAC, Philadelphia 24.*

Is said to be capable of handling air continuously at temperatures to 400 F, pressures to 100 psi. With inside diameters ¾ to 5 in., lengths to 50 ft. Is strong, lightweight, flexible, says company.

Equipment Briefs . . .

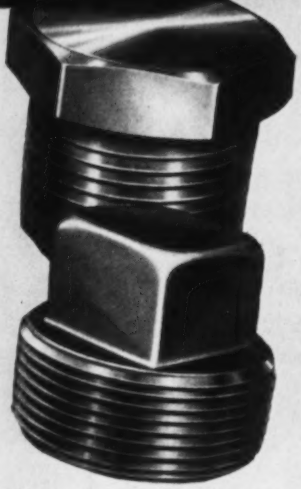
INSULATION WRAP designed to prevent condensation dripping from cold pipes—*Presstite Engineering Co., Dept. HPAC, 3798 Chouteau Ave., St. Louis.* Cited features are shape, method of application. "Kwik-wrap" may be applied longitudinally to pipe. 30 in. strip cross cut each 24 in. so can be separated in 2 ft lengths for application.

GAS VALVES with optional manual opening device—*Penn Controls, Inc., Dept. HPAC, Goshen, Ind.* Manual opener feature permits operation of gas furnace if electric power supply is disrupted, says company. Device available on ½, ¾ in. valves.

AIR COOLING CALCULATOR for evaporative air coolers—*International Metal Products Co., Dept. HPAC, P. O. Box 1712, 500 S. 15th St., Phoenix, Ariz.* Designed to simplify sizing of coolers, ductwork. Building dimensions expressed in feet, meters.

DRY LUBRICATION PROCESS for application to metallic surfaces—*U. S. Engineering Co., Dept. HPAC, 14550 Lesure Ave., Detroit 27.* Formulated for use where ordinary oils, greases not feasible, desirable. "Useco-Lube" impregnates, film coats any metallic surface; leaves no surface build-up, says company.

PLUGS for
PRESSURE



FORGED STEEL
HIGH PRESSURE
PLUGS WITH
Dry Seal
TAPERED THREADS

Both CAPITOL square head and hex head solid plugs have dry seal tapered threads to assure safe, permanent high pressure installations. Individual thread protectors for maximum protection. Conveniently packaged for easier handling.

Square Head Solid Plugs sizes 1" thru 2", all forged steel. Hex Head Plugs sizes ½" thru 2" machined from solid bar.

You'll like these
thread protectors, too!

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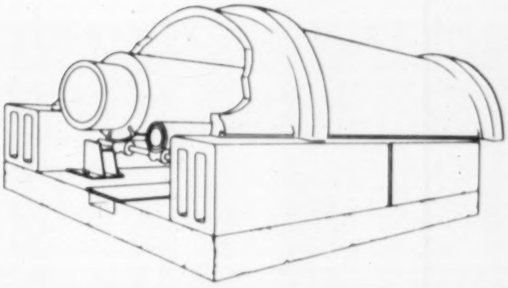
CAPITOL
MFG. & SUPPLY CO.
COLUMBUS, OHIO

COUPLINGS — NIPPLES — UNIONS — RADIANT
HEAT FITTINGS — FURNACE COILS —
WELL SUPPLIES — STEEL PIPE FITTINGS

STILLWATER CONDUIT SYSTEMS

Made with Vitrified Clay For PERMANENT Protection of Underground Piping



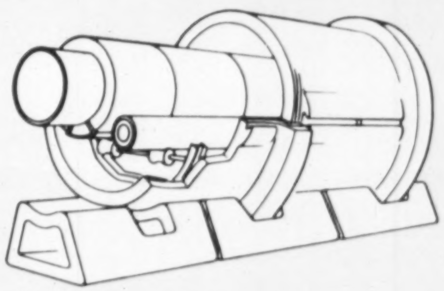
TUNNEL SYSTEM

. . . installed on a simple concrete pad. With Tunnel Arch in ten sizes and Side Blocks in three sizes, any combination of piping can be used.

When you're planning a conduit system to protect vital underground piping, five or ten years of corrosion resistance isn't enough. Good construction practice and sound business sense call for the *permanent* protection of a Stillwater Conduit System built with never-wear-out Vitrified Clay. Vitrified Clay is the *only* conduit material that is permanently safe against corrosion by ground water and chemical or electrolytic action of the soil. It's the only material that can't expand or contract with changes in temperature. It guards your underground service piping for generations—in fact, each component manufactured by Stillwater is *guaranteed for 50 years.*

A Stillwater Conduit System can be designed to handle any combination of service pipe the job requires. Experienced Stillwater engineers are ready to give you complete start-to-finish assistance in planning, estimating, and supervising construction of an efficient, trouble-free system.

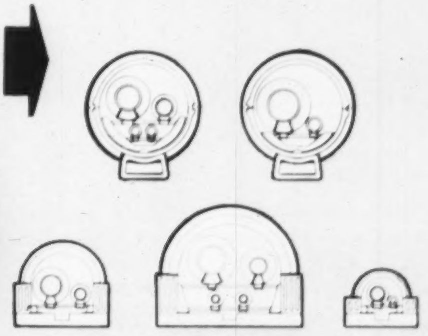
WRITE FOR the new Stillwater Conduit Systems Bulletin, with detailed product data.



ROUND SYSTEM

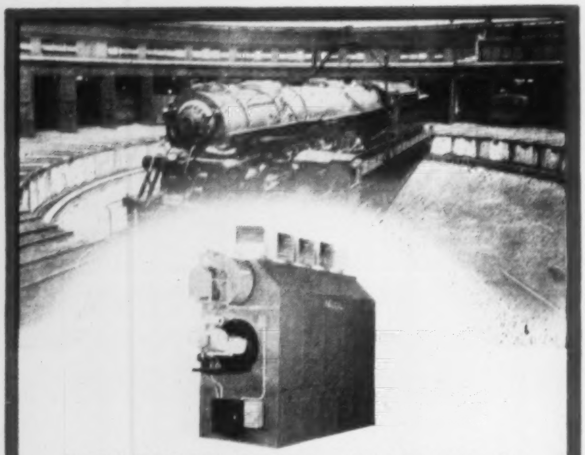
. . . supplied complete with combination underdrain and support structure. Available in 12 sizes, each with the proper underdrain support.

Diagrams show just a few of the hundreds of service piping combinations that can be protected with Stillwater Conduit Systems.



STILLWATER
CONDUIT SYSTEMS
DIVISION OF
THE STILLWATER CLAY PRODUCTS CO.
3334 Prospect Avenue, Cleveland 15, Ohio

SW-156-61



LEADING RAIL CARRIERS
put their confidence in

NATIONAL Champion
DIRECT FIRED HEATERS

Approved by American Gas Association

For placing heat where and when it is needed in roundhouses, locomotive and car repair shops this National Champion "Model H" does the job with the utmost efficiency and economy. National Champion Heaters are engineered to meet the most demanding requirements of industry. No matter what your heating need, there's a National Champion especially designed to fill the bill. National Heaters come in 6 models — 66 sizes from 200,000 to 2,000,000 BTU capacities. Check these outstanding features.

- 80% guaranteed heating efficiency
- Direct fired for gas, oil or combination fuels
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- 70%-150% more heat transfer area than similar units
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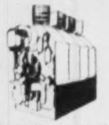
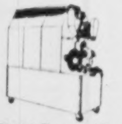
- Highest available external static pressures
- Electronic flame failure control
- Completely wired, assembled and flame-tested at the factory to guarantee peak performance
- Listing by Underwriters' Laboratories, Inc.

Write today for complete information and specifications

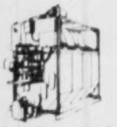


Model H — vertical unit with discharge heads 12 sizes

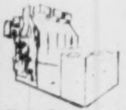
Model D — vertical unit for duct work. 12 sizes



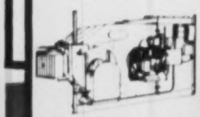
Model P — portable, vertical unit for flexible duty. 6 sizes



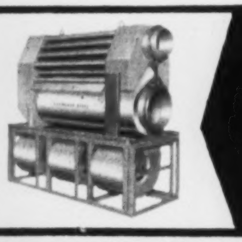
Model R — inverted unit with discharge heads at bottom 12 sizes



Model S — vertical unit with side blowers to permit proper location of air mixing dampers 12 sizes.



Model C — horizontal ceiling suspension unit for space saving. 12 sizes.



Teardrop design Combustion Chamber the "heart" of National Champions

NATIONAL HEATER CO., INC.
2180 Cleora Ave. St. Paul 4, Minn.

FOAM PLASTIC TAPE with pressure sensitive backing—*United Mineral & Chemical Corp., Dept. HPAC, 16 Hudson St., New York 13.* "Tesamoll" provides cushioning, sound absorption, says company. In rolls of 3/8 to 19 in. widths.

NICKEL-PHOSPHOROUS BRAZING ALLOY with low brazing temperature—*Wall Colmonoy Corp., Dept. HPAC, 19345 John R St., Detroit 3.* "Nicrobraz No. 10" designed for low temperature joining of stainless steels, nickel base alloys, cobalt base alloys, low alloy steels, carbon steels, copper, other base metals with melting points above 1900 F.

ELECTRIC HOT WATER GENERATOR designed to provide heat quickly, "at the turn of a switch"—*Precision Parts Corp., Dept. HPAC, 400 N. First St., Nashville 7.* Recommended by company for heating churches, hospitals, commercial buildings; snow melting; controlling temperatures in swimming pools; supplying hot water; providing auxiliary heating system.

PROTECTIVE CASE for out-of-doors time switch installations—*International Register Co., Dept. HPAC, 2620 W. Jackson Blvd., Chicago.* Designed for several series of company's "Intermatic" switches. Has top hinged doors, knockouts to provide access to terminal blocks, rain visor over top of door.

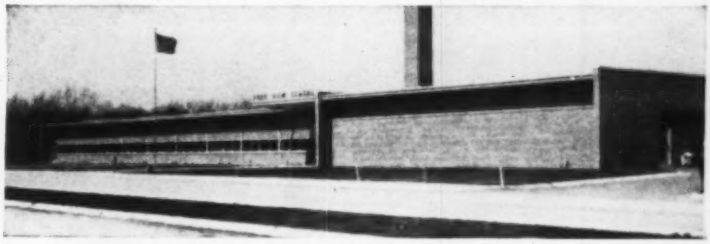
FLEXIBLE DUCT CONNECTIONS in new lengths, gages—*Grant Wilson, Inc., Dept. HPAC, 141 W. Jackson Blvd., Chicago 4.* "Vibra-Stop" and "Flexi-Duct" connectors now available in 25, 50, 100 ft rolls. "Vibra-Stop" fabricated with 24 or 26 gage galvanized metal.

HEAT FLOW DISC designed for high sensitivity—*National Instrument Laboratories, Inc., Dept. HPAC, 6108 Rhode Island Ave., Riverdale, Md.* Made of special tellurium alloy, is so sensitive that 1 Btu per sq ft per hr generates 2.5 microvolts, says company. Cited advantage is low thermal, electrical resistance resulting from thin, single junction construction.

GAS VALVE with diaphragm, solenoid features—*Minneapolis-Honeywell Regulator Co., Dept. HPAC, 2641 Fourth Ave., S., Minneapolis 8.* Moving parts cushioned in oil to facilitate quiet operation. Has sealed, oil filler powerhead with magnetic operator to provide motivating force.

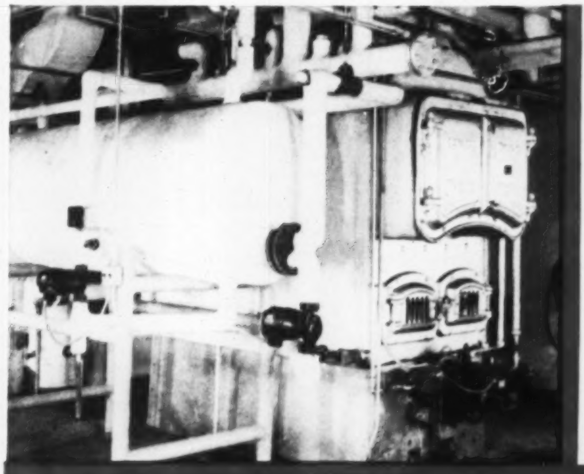
SET SCREW for soft metal applications—*Set Screw & Mfg. Co., Dept. HPAC, 460 Main St., Bartlett, Ill.*

B&G *Hydro-Flo** System



PARK VIEW SCHOOL—MORTON GROVE, ILLINOIS
Consulting Engineer and Architect: Thomas J. Higgins Associates, Chicago, Illinois
Heating Contractor: E. J. Claffey, Chicago, Illinois
Plumbing Contractor: Fred Dietz, Chicago, Illinois

matches modern heating to modern design



B&G Boosters are employed for pumping boiler water through a B&G Tank Heater and for recirculating hot service water through the system lines.

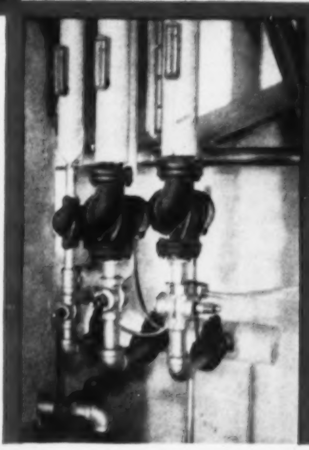
In this fine example of modern school design, the superior qualities of forced hot water as a heating medium are fully exhibited. Baseboard heating panels and radiant floor panels are used, to satisfy the comfort and health requirements of small children. For example, the radiant panels in the kindergarten permit children to take their daily naps upon throw rugs on the floor.

The close temperature control possible with B&G *Hydro-Flo* Heating . . . its economy of operation . . . its adaptability to zoning for varying temperature requirements, all account for the preference given it by designers and builders of today's schools.

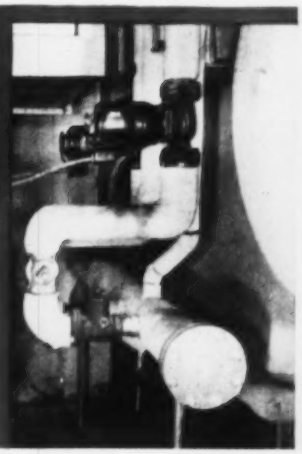
For the most satisfactory solution to any heating problem, get the facts on B&G *Hydro-Flo* Heating. Send today for B&G Product Catalog.

"Water is the most efficient and economical medium for conveying a BTU"

B & G
BOOSTER
PUMPS
The most complete line of pumps designed specifically for forced hot water heating systems . . . constructed in every detail to operate quietly, perform dependably and last for years!



Two 2½" B&G Boosters supply hot water to baseboards in north and south classrooms. Radiant floor panels in the kindergarten are circulated by a 1¼" B&G Booster.



B&G Boosters circulate hot water to a unit heater in the lobby and to radiant floor panels in the lunch and all-purpose rooms.

BELL & GOSSETT COMPANY

Dept. EG-5, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, West Toronto

*Reg. U.S. Pat. Off.

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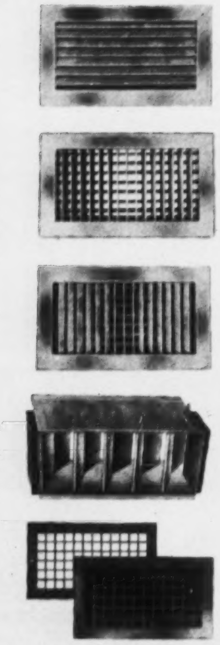
the complete **Quality** line of



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for commercial cooling and ventilating

GENERAL REGISTER — a name now known thru the Industry for consistent quality — production-line quality of the standard of the sales sample.

A leader of the grille manufacturing field, with the finest of high-production, precision-tooled facilities, geared for volume output.

A product with the most advanced design features, including:

- **Smooth, Solid Welded Frames**
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Investigate the Line that's "Second to None"!

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CORPORATION
14 FACTORY ST., CEDAR GROVE, ESSEX CO., N. J.

"Spred-Lok" has headless, self locking design. In manufacture, top of screw is spread slightly which, by taking up "flow" of soft metal, causes locking action.

REFRIGERATIVE AIR CONDITIONER for automobiles—*Frigikar Corp., Dept. HPAC, 1602 Cochran, Dallas.* "MagneTouch" control, feature of 1956 models, is said to eliminate bypass valve currently used on most car conditioners.

SHOP HEATER, INCINERATOR-STOVE combination—*Hoskinson Industries, Dept. HPAC, Falmouth and Denton Aves., New Hyde Park, N. Y.* Burns rubbish, eliminating cost of having it carted away, and provides odorless, clean heat to shop and office, says company. Is said to heat up to 2000 sq ft of floor space.

PSYCHROMETER-CONDITIONER for laboratory applications—Distributed by *Air Conditioning Industries Co., Dept. HPAC, Houston.* "Psychronditioner" is said to provide positive, accurate control of psychrometry in laboratory regardless of outside weather conditions.

FLUX for high temperature brazing of chromium and nickel alloys—*Air Reduction Sales Co., Dept. HPAC, 60 E. 42nd St., New York 17.* Is said to be free flowing in 1400 to 2000 F temperature range. Stainless steel assemblies in aircraft, automotive, pharmaceutical, similar industries are cited applications.

HEAVY FUEL OIL ADDITIVE formulated with gel breaking detergent action—*Stewart-Hall Chemical Corp., Dept. HPAC, P.O. Box 66, Fleetwood, Mt. Vernon, N. Y.* For Nos. 4, 5, 6 oil. "Desludgit," said to be noncorrosive and nonexplosive, has 206 F flash point. Designed to break up oil-water gels, dissolve sludge, emulsify water in oil.

the plumbers GRAB BAG

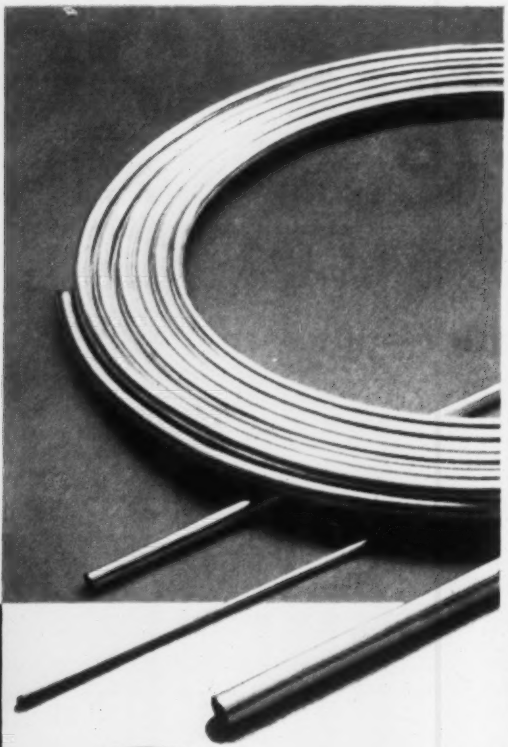
- CONTINUOUS EVEN DEPTH THREAD
- HEAVY GALVANIZED COATING
- DEEP ROUND CHAMFER
- CLEAN OUTSIDE FINISH
- PRESSURE TESTED

WHEATLAND
PRECISION
STEEL COUPLINGS

WHEATLAND STEEL PRODUCTS CO.

BANKERS SECURITIES BUILDING • PHILADELPHIA 7, PENNSYLVANIA

Design QUALITY into your installation



Specify

UNITED copper water tube

Combine prompt shipments with quality control production and you have the key to why more and more United copper water tube is being specified and used every day.

- Orders received before noon are shipped that day! (from main plant or warehouses in key cities).
- Every inch of United copper water tube is produced under strict quality control . . . in a precision tube mill where the most rigid requirements are commonplace.
- Available in color coded 20′ straight lengths and 60′ coils.
- For radiant heating, specify 1/4, 3/8 and 1/2 type L in 100′ coils.

For permanently united copper joints — braze with PHOSON!

United
COPPER
WATER
TUBING

Permanently United

UNITED WIRE
AND SUPPLY CORPORATION
PROVIDENCE 7, R. I. • OFFICES IN PRINCIPAL CITIES

LOOK TO UNITED FOR THE BEST IN ALUMINUM, COPPER AND BRASS TUBE AND WIRE

RECENT TRADE LITERATURE . . .

▸ *DETERMINING BOILING POINT, RANGE* Bulletin BPBR-1-55 describes company's new analytical method for determining boiling point and boiling range of most refrigerants. *General Chemical Div., Allied Chemical & Dye Corp., Dept. HPAC, 40 Rector St., New York 6.*

▸ *VALVES, FITTINGS, SUPPLIES*—Company's line of valves, fittings, supplies for ammonia, fluorinated hydrocarbon refrigerants, other high pressure services detailed in new bulletins. Units described, illustrated, with specifications given for each. *Frick Co., Dept. HPAC, Waynesboro, Pa.*

▸ *CONTROLS*—New 52 page catalog No. 856 describes, illustrates, gives specifications for company's line of mercury switch equipped controls for heating, refrigeration, air conditioning, industrial applications. *Mercoid Corp., Dept. HPAC, 4201 Belmont Ave., Chicago 41.*

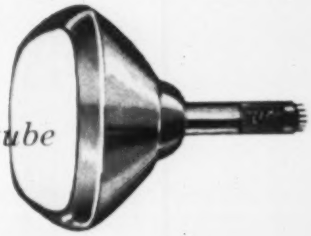
▸ *SELF PRIMING PUMPS*—"Little Gem" motor driven, self priming pump for construction, industrial, marine applications covered in bulletin No. GT-155. Pump specifications, performance curves included in 4 page folder. *Bell & Gossett Co., Dept. HPAC, Morton Grove, Ill.*

▸ *HOSE, FITTINGS, COUPLINGS*—New 64 page catalog No. 200 covers, illustrates company's line of low, medium, high pressure hoses for air, water, fuel, lubrication and hydraulic applications, also hoses for special applications. Includes information on detachable, reusable fittings and couplings. *Aeroquip Corp., Dept. HPAC, 300 S. East Ave., Jackson, Mich.*

▸ *INDUSTRIAL FANS*—Series "106" industrial fans designed to provide complete coverage of industrial, materials handling requirements

AIR CONDITIONER

like the electronic gun in a TV picture tube



A.O.Smith
HERMETIC MOTORS
are quality-built to be

SEALED AND FORGOTTEN

A. O. Smith hermetic motor stators undergo surge comparison and dynamometer tests.

Just as the dependability of a modern TV picture tube is governed by the performance of a hermetically sealed electronic gun — so too, the dependability of an air conditioning compressor rests on the performance of its hermetically sealed motor.

A. O. Smith hermetic motors really can be *sealed and forgotten.* They're quality-built . . . dynamically-balanced for years of quiet, vibrationless service. Each motor is manufactured with particular attention to every detail . . . assembled and tested in controlled atmospheric conditions, ever-free of dust and foreign matter.

A. O. Smith hermetic motors are application-engineered to match your compressor design. They're available in single-phase, 1½ through 5 hp and polyphase, 1½ through 10 hp.

Write for all the facts on A. O. Smith Hermetic motors.

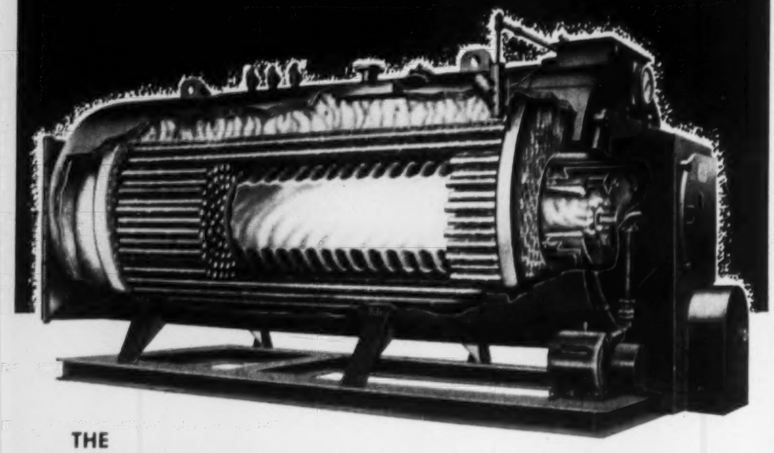
Choose from a complete line of A. O. Smith quality motors —

SINGLE-PHASE, capacitor-start, induction-type motors from ⅓ through 5 hp.
POLYPHASE, squirrel-cage, induction-type motors from ⅓ through 150 hp.

Through research . . . a better way

A.O.Smith
CORPORATION
ELECTRIC MOTOR DIVISION
Tipp City, Ohio
INTERNATIONAL DIVISION: MILWAUKEE 1, WISCONSIN

GET YOUR
STEAM and HOT WATER
FROM A LOW COST PRODUCER!



THE
Continental AUTOMATIC BOILER

- generates the steam and hot water you need at low fuel cost and with little maintenance.
- is highly efficient—over 80% guaranteed—due to its unique "spinning gas technique".
- can be opened for cleaning or inspection by one man in less than ½ hour, for it has hinged doors at both ends.
- distributes heat evenly to the rear tube-sheet and all return tubes. This results in balanced water circulation and uniform longitudinal expansion of the entire pressure vessel.
- has long service life because of free, rapid water circulation, uniform heat transfer, simplicity of construction and quality workmanship.

Fully automatic, Continental Boilers are used for hot water and high or low pressure steam applications. Units range from 20 to 500 hp and can be gas, oil or combination fired.

Write for catalog and the name of your nearest distributor. Let us bid on the next boiler you need.

Send for all the facts on the Continental Automatic Boiler.

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BOILER ENGINEERING
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RECENT TRADE LITERATURE

Continued

described in 72 page bulletin 5306. Catalog covers wheels and arrangements, optional construction, modifications, special design and construction details for high temperature operations. *American Blower Corp., Dept. HPAC, Detroit* 32.

▶ *FIRM SPECIFICATIONS vs BUILDING COSTS*—Reprint of much discussed talk, "Firm Specifications and their effect on Building Costs," given at second annual Heating and Air Conditioning Conference, available from *Fred H. Schaub Engineering Co., Dept. HPAC,* 2110 *S. Marshall Blvd., Chicago* 23.

▶ *GEL INHIBITORS*—Detailed information on company's inhibitors and a test procedure for determining their effectiveness against copper mercaptide gel contained in new literature. *Monsanto Chemical Co., Dept. HPAC,* 1700 *S. Second St., St. Louis* 4.

▶ *DUCTS, SLEEVES, COUPLINGS*—Catalog No. 503 describes, illustrates, provides complete data for company's line of "Airtron" ducts, fittings, couplings. *Arrowhead Rubber Co., Dept. HPAC, Downey, Calif.*

▶ *HYDRAULIC TEST STAND*—New hydraulic test stand, designed to handle pressures 500 to 5000 psi, covered in engineering data sheet. Bulletin lists controls, suggested applications. Dimensional diagrams presented. *Auto-Control Laboratories, Dept. HPAC,* 5665 *Selmaraine Dr., Culver City, Calif.*

▶ *STEEL*—New 16 page booklet, "Special Steels for Industry," gives details as to stainless steels, electrical materials, carbide materials, tool steels. Charts give analyses of various steels. Information on fabrications, properties included. *Allegheny Ludlum Steel Corp., Dept. HPAC,* 2020 *Oliver Bldg., Pittsburgh* 22.

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"That's where you're wrong! The diffusers are already in place . . . we're using completely concealed MULTI-VENT . . ."

The integrity of a clean, attractive ceiling can be maintained unbroken when you work with Multi-Vent low velocity air diffusers.

Multi-Vent diffusers can be completely concealed. Nothing protrudes to create problems in symmetry or architectural effect.

This concealability provides still another advantage at a practical level: Partitions can be placed anywhere, and re-located at will with complete freedom. The Multi-Vent panels need not be moved, altered in any way, or even adjusted.

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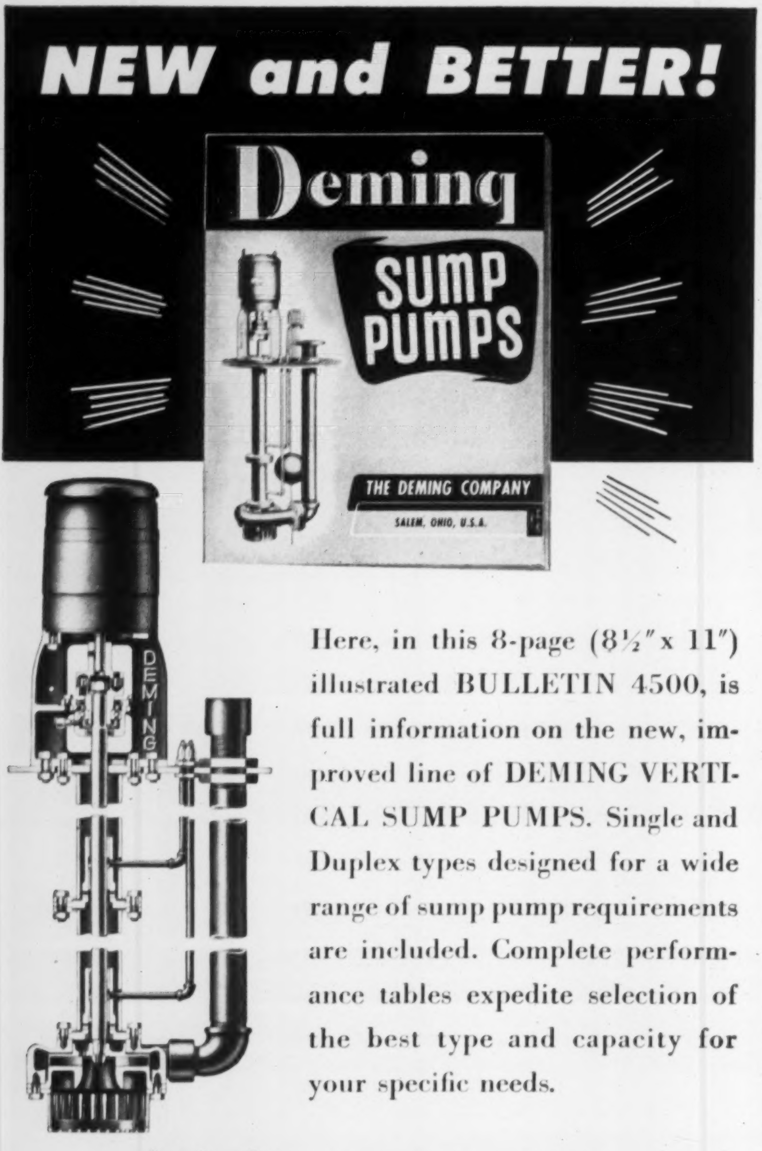

Here, in this 8-page (8½" x 11") illustrated BULLETIN 4500, is full information on the new, improved line of DEMING VERTICAL SUMP PUMPS. Single and Duplex types designed for a wide range of sump pump requirements are included. Complete performance tables expedite selection of the best type and capacity for your specific needs.

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▶ *VALVES*—New 36 page catalog PV-4 shows in detail company's complete line of iron, steel lubricated plug valves. Illustrates single, screwed and bolted gland types. Includes physical data on dimensions, ratings. *Wm. Powell Co., Dept. HPAC, Cincinnati 22.*

▶ *FLUIDS, LUBRICANTS*—Synthetic fluids, lubricants described in new 52 page booklet (form 6500D). Literature covers properties, applications, characteristics of these polyalkylene-glycol derivatives. *Carbide and Carbon Chemicals Co., Dept. HPAC, 30 E. 42nd St., New York.*

▶ *PUMPS*—New 16 page catalog No. 3007 covers company's line of "heavy duty" wet pit pumps for drainage, flood water, effluent boiler blowoff, similar applications. Drawings, tables, curves discuss, describe design features. *Yeomans Bros. Co., Dept. HPAC, 2000-5 N. Ruby St., Melrose Park, Ill.*

▶ *DUST, FUME COLLECTORS*—Bulletin No. 1155 is descriptive literature giving complete technical details of company's wet type dust and fume collectors. *Zack Co., Dept. HPAC, 4600 W. 12th Pl., Chicago 50.*

▶ *INDUSTRIAL COAL DUST CONTROL*—Bulletin 551-D on control of dust from coal handling operations discusses use of local exhaust ventilation and cloth-tube-type dust collectors. Four illustrated case histories presented. *Wheelabrator Corp., Dept. HPAC, Mishawaka, Ind.*

▶ *BASEBOARD CONVECTORS*—Features of "Perimaheat" baseboard convectors illustrated, described in form No. 4455. Installation procedure shown. *Young Radiator Co., Dept. HPAC, Racine Wis.*

▶ *ZINC SHIELDING*—New 4 page folder describes company's galvanic protection of zinc as means of com-

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Meeting all 26 Industry Requirements

Time Tested and Accepted Natural Hair Media treated with the new miracle SARAN makes possible a light weight low-density filter of extraordinary performance, long life and simple maintenance. Filtr-Aire does the job better from the moment of installation. The value of your system is protected.

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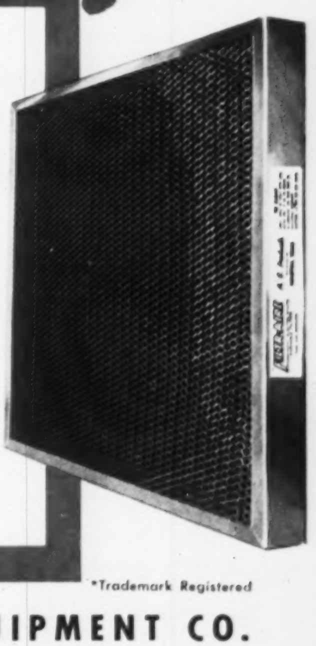

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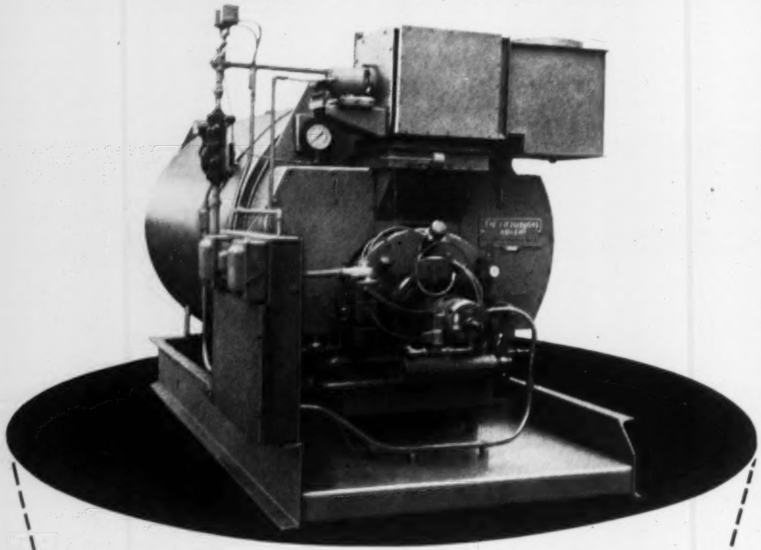

Budgets, both installation and operating, get a big assist when the Fitzgibbons Packaged Boiler Unit provides dependable, low cost heat. Factory assembly slices installation costs. Factory testing assures an efficient, fully automatic unit ready for immediate firing. Fitzgibbons' unique *full wet back* rear furnace walls eliminate rear refractory and recurring replacement costs. And Fitzgibbons backs up performance. Realistically rated at 8.2 sq ft heating surface per boiler hp with guaranteed gross output based on 5.0 sq ft heating surface per boiler hp. For complete information, write Fitzgibbons Boiler Company, Inc., 101 Park Avenue, New York 17, N.Y.

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ENGINEER: Sam Alpert, Newark, N. J. **HEATING CONTRACTOR:** David Schrenell & Co., Union, N. J.

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RECENT TRADE LITERATURE

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batting corrosion of iron or steel. Uses, advantages to user, directions for application given. *Wilbur & Williams Co., Dept. HPAC,* 130 *Lincoln St., Boston* 35.

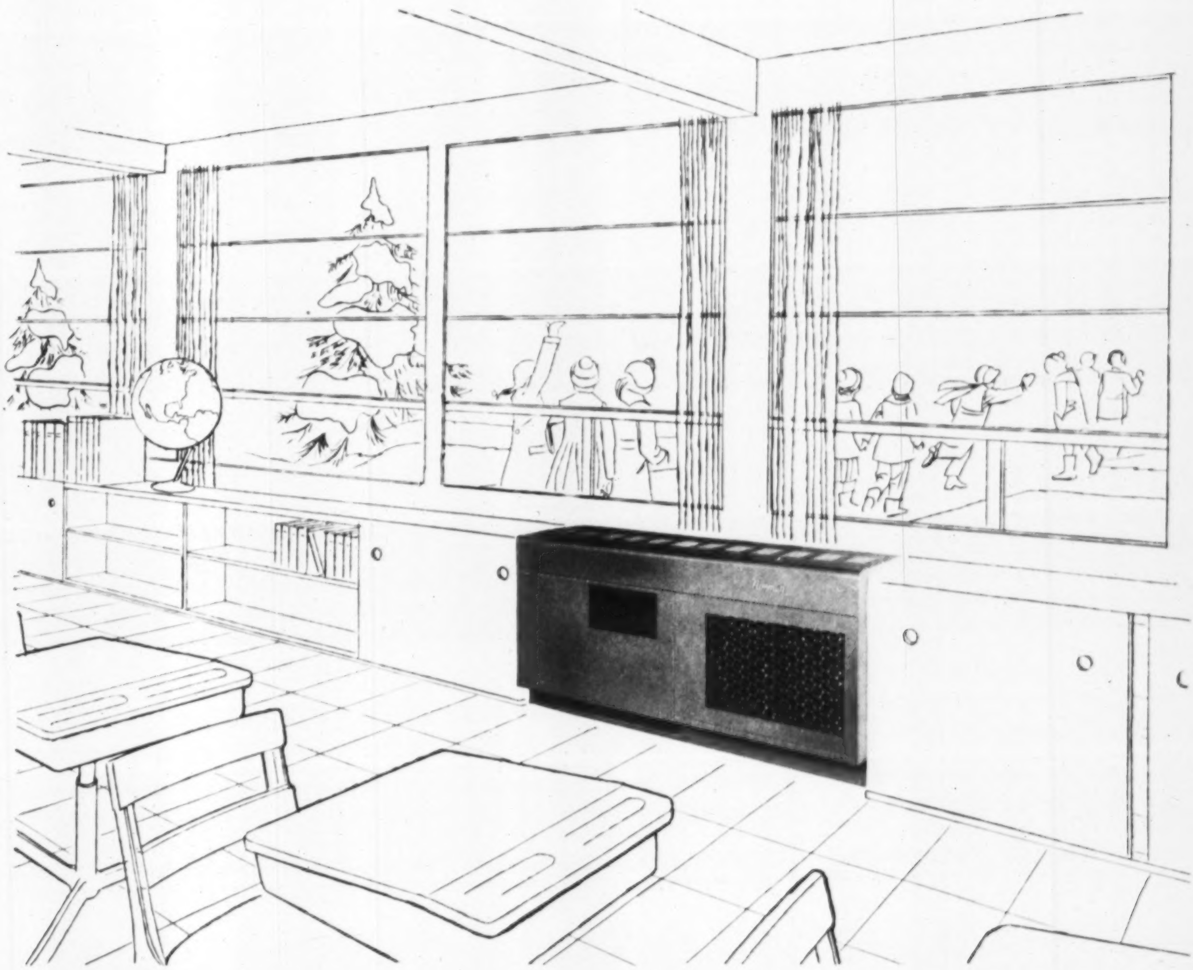
▸ *CENTRIFUGAL FANS*—"Airfoil" centrifugal fans described in new bulletin A-102. Fans are said to have efficiencies of over 92 percent, operate on 35 percent less power, have noise level reduced by 65 percent. *Chicago Blower Corp., Dept. HPAC,* 9869 *Pacific Ave., Franklin Park, Ill.*

▸ *CONDENSERS, COMPRESSORS*—New literature available to air conditioning, refrigeration industry covers company's condensing units, motor-compressors, automotive compressors, truck refrigeration. *Copeland Refrigeration Corp., Dept. HPAC, Sidney, Ohio.*

▸ *MECHANICAL FLOWMETER*—Specification sheet 242-2 describes mechanical flowmeters designed with evenly graduated charts, scales. Meter body, which is characterized bell float, is mounted integrally with measuring instrument, forming self contained measuring system for pipe stand or panel mounting close to point of measurement. *Minneapolis-Honeywell Regulator Co., Industrial Div., Dept. HPAC, Wayne and Windrim Aves., Philadelphia* 44.

▸ *ALLOYS*—New 28 page bulletin on alloys for heat exchange problems presents typical installations of cupronickel-copper alloys in power plants. Alloys are said to give longer life, dependable service under ordinary conditions and when plagued by pollution, brackish water or excessive turbulence. *International Nickel Co., Inc., Dept. HPAC,* 67 *Wall St., New York* 5.

▸ *TUBING FABRICATION*—Reference card gives tubing fabrication data for diameters $\frac{1}{2}$ to 4 in. Also,



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The new Norman Schoolroom Heater provides all the advantages of a central heating system **at low cost.** It is a big part of the answer to keeping **school construction costs down.**

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Most important, the gas-fired Norman Schoolroom Heater provides clean, filtered warm air that assures real comfort without hot blasts, cold spots or drafts.

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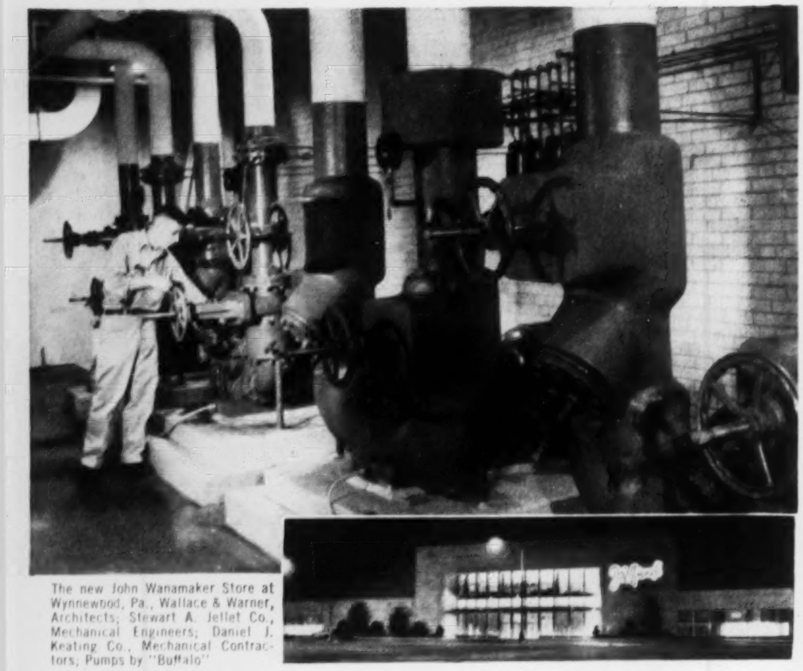

The new John Wanamaker Store at Wynnewood, Pa., Wallace & Warner, Architects; Stewart A. Jellet Co., Mechanical Engineers; Daniel J. Keating Co., Mechanical Contractors; Pumps by "Buffalo"

Chilled Water Handled by "BUFFALO" Pumps in new John Wanamaker Store

These five insulated "Buffalo" Double Suction Type SL Pumps keep chilled water on the move to serve the comfort requirements of the new John Wanamaker Store at Wynnewood, Pa. Four other "Buffalo" Pumps deliver condenser water to a roof cooling tower. Because the designers of this beautiful store realized the importance of the pumps in the system, they looked for pumps of unquestioned reliability — and chose "Buffalo", the name backed by 79 years of proved performance in every type of industrial and commercial installation. There's a "Buffalo" Centrifugal Pump for *your* job — ask your nearby "Buffalo" Engineering Representative for recommendations!

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

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A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

RECENT TRADE LITERATURE
Continued

provides information on maximum bend angles for various diameters. *Nikoh Tube Co., Dept. HPAC, 5000 S. Whipple St., Chicago 32.*

▶ *REMOTE CONDITIONERS*—Catalogs 7754A, 7755-1, 7755-2, 7755-3 cover remote type "Roomaire" conditioners in concealed floor, concealed horizontal, horizontal cabinet models. Bulletins contain features, heating and cooling capacities, specifications, dimensional data. *Young Radiator Co., Dept. HPAC, Racine, Wis.*

▶ *STAINLESS, ALLOY STEEL FITTINGS*—Engineering data, size dimensional information on forged stainless and alloy steel fittings presented in new 8 page bulletin S-1-55. Fittings are for high temperature, corrosive applications in petroleum, chemical, other process industries and in power plant high pressure-high temperature steam piping. *W-S Fittings Div., H.K. Porter Co., Inc., Dept. HPAC, 342 Madison Ave., New York.*

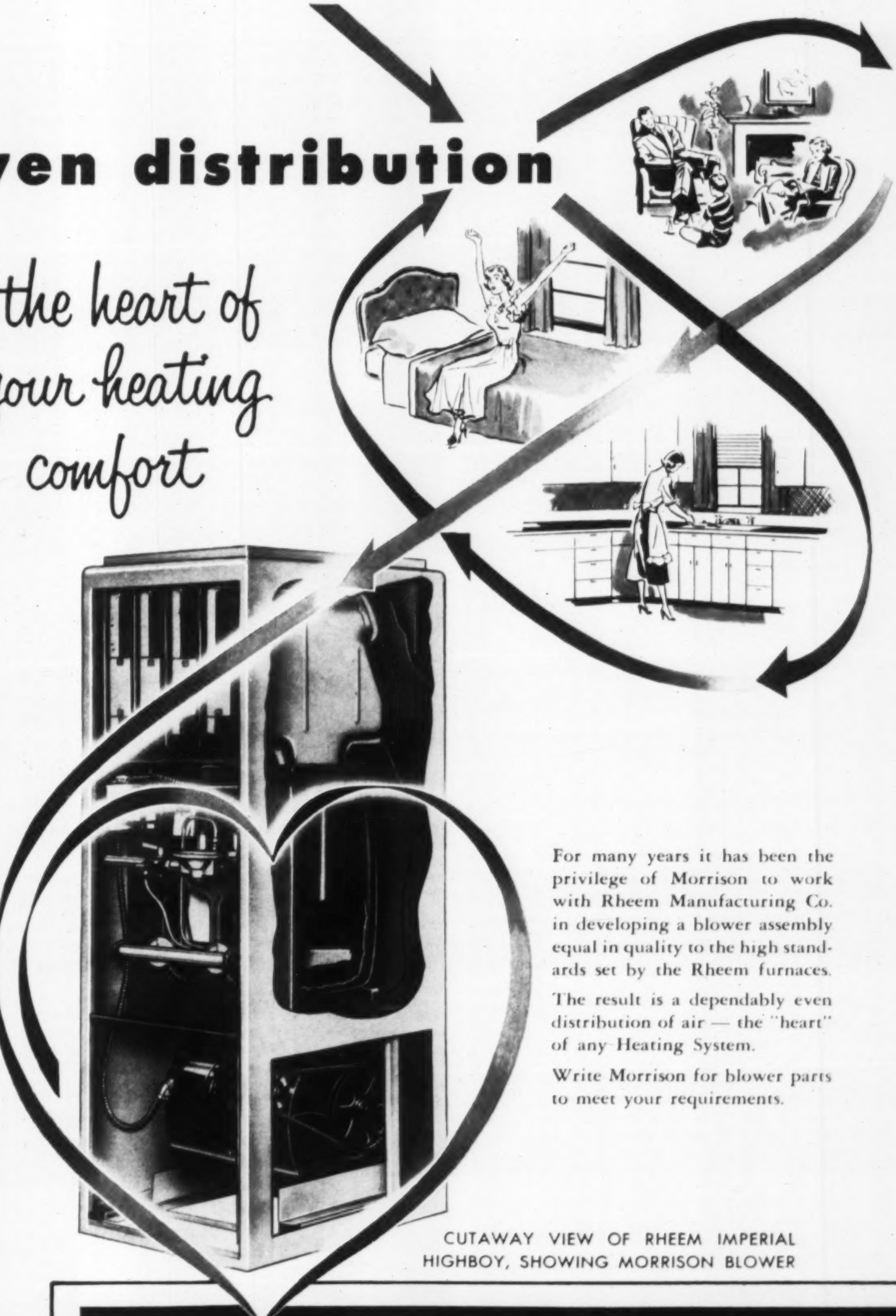
▶ *THERMOSTATS*—New 2 page bulletin on company's type "D" thermostats describes various styles available; includes information on operating principles, performance data, ratings, dimensions, mounting arrangements, applications. *Stevens Mfg. Co., Inc., Dept. HPAC, Mansfield, Ohio.*

▶ *PRESSURE CONTROLLER*—Bulletin 7040 describes new indicating pressure controller designed with small case. Unit available in ranges 0-50 to 0-200 psi, with "on-off" or 10 percent "Throttlor" control. *Minneapolis-Honeywell Regulator Co., Industrial Div., Dept. HPAC, Wayne and Windrim Aves., Philadelphia 44.*

▶ *TEMPERATURE RISE CHART*—Manufacturer has issued temperature degree rise chart for its "WH" series twin tankless volume water heaters. Chart is said to compute at a glance the degree rise in gallons per hour

Even distribution

the heart of your heating comfort



For many years it has been the privilege of Morrison to work with Rheem Manufacturing Co. in developing a blower assembly equal in quality to the high standards set by the Rheem furnaces.

The result is a dependably even distribution of air — the "heart" of any Heating System.

Write Morrison for blower parts to meet your requirements.

CUTAWAY VIEW OF RHEEM IMPERIAL HIGHBOY, SHOWING MORRISON BLOWER

MORRISON PRODUCTS INC.

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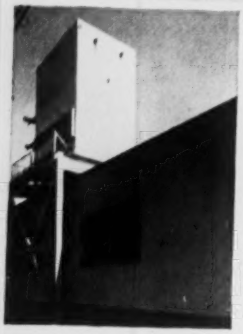

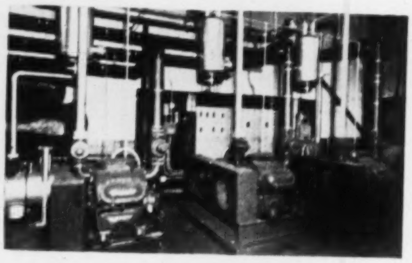

Baltimore Motor Vehicles Department whose personnel are now enjoying the comfort of Vilter Air Conditioning.

Vilter Evaporative Condenser is mounted on the roof of a garage across the street from the department.

These three 6-cyl. Vilter Multi-Cylinder compressors handle the 210-ton air conditioning load of the Baltimore Motor Vehicles Dept.

How do you cool a hot spot ...in a hurry?

with Vilter AIR CONDITIONING EQUIPMENT... that

costs less to own*

When the heat's on weather wise and installation wise, a rapid moving team of trained Vilter field representatives and home office engineers can bring a wealth of broad, integrated experience to bear immediately on your problem.

Such was the case of the Baltimore Motor Vehicles Department whose officials early in the year decided to air condition their building . . . wanting it in time for Summer. Prompt Vilter teamwork completed the job ahead of schedule.

This all Vilter installation includes three Multi-Cylinder compressors, an evaporative condenser, a flooded water chiller complete with heat exchanger and all necessary controls.

Success! This Vilter installation has provided the type of trouble-free cooling expected and the Baltimore people have expressed complete satisfaction with the equipment and handling of the job.

Vilter equipment, known and proven for over 88 years, is rugged, provides long years of dependable economical service and efficient operation—all pluses which make for a sound investment. Why don't you Standardize on Vilter, too?

* Savings in low first cost are not the complete answer when considering the installation of refrigeration equipment. But savings in terms of years of extra service, reliable performance and minimum maintenance—that's where Vilter excels in low-cost ownership.

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Air Units • Ammonia & Freon Compressors • Booster Compressors • Baudelot Coolers • Water & Brine Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pipe Coils • Valves & Fittings • Pakice & Polarflake Ice Machines

RECENT TRADE LITERATURE

Continued

for single, dual hot water temperatures. *Portmar Boiler Co., Dept. HPAC, 193 Seventh St., Brooklyn.*

▶ *WATER HEATERS*—Cited advantages of gas fired storage type automatic water heater to furnish domestic hot water for multiple dwellings set forth in form 982. Folder describes "Sanimaster," designed to deliver two temperatures of hot water from single tank. *Ruud Mfg. Co., Dept. HPAC, Kalamazoo, Mich.*

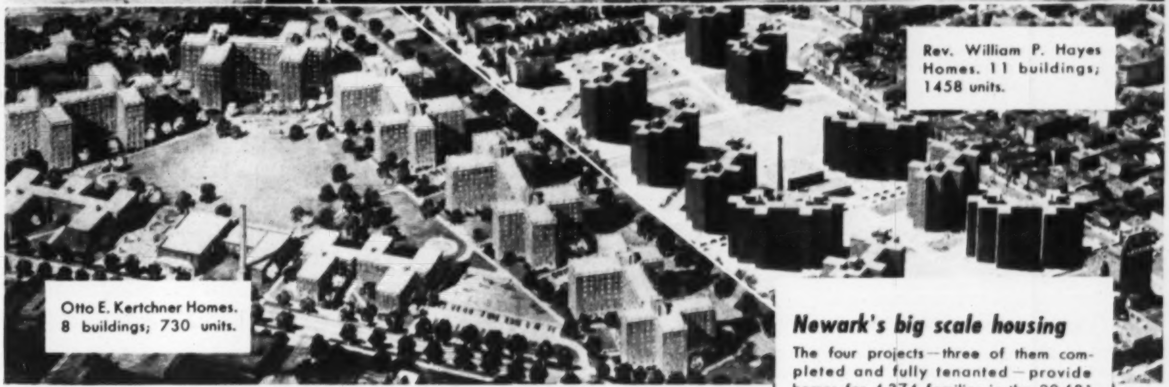
▶ *FLOW TRANSMITTER*—Specification sheet 248 describes differential converter mercuryless and liquid level transmitter, with nonbleed pilot relay. These operate on pneumatic balance principle, transmit readings to receiving instruments at distances to 1000 ft from point of measuring, says company. *Minneapolis-Honeywell Regulator Co., Industrial Div., Dept. HPAC, Wayne and Windrim Aves., Philadelphia 44.*

▶ *GAS BURNERS*—Bulletin G-200-B describes "Fan-Air" gas burner for forced, induced or natural draft operation in power plants. Burners manufactured as completely packaged, fully automatic heating systems in capacities ranging 400,000 to 25 million Btu input. *Mettler Co., Inc., Dept. HPAC, 5366 Worth St., Los Angeles 63.*

▶ *SOLDER END VALVES*—Circular describes new line of five bronze, solder end valves. Designed as companion line to screwed end gate valve series. Adaptable for service in schools, hospitals, apartments, hotels, other commercial structures, says company. *Lunkenheimer Co., Dept. HPAC, Box 360, Cincinnati 14.*

▶ *ROTARY AIR, VACUUM PUMPS*—New 12 page catalog No. 755 gives details of construction, dimensions, capacities and performance curves on company's line of rotary air and vac-

Archbishop Thos. J. Walsh Homes. 13 buildings; 630 units.


Rev. William P. Hayes Homes. 11 buildings; 1458 units.
Otto E. Kertchner Homes. 8 buildings; 730 units.

Thousands of MARSH Valves and Traps for this big Newark project!

A bright spot in the dark clouds that overhang Humanity is America's big drive to solve the housing problems of congested cities.

The development pictured here is in Newark. It consists of four projects, comprising a total of 41 big buildings containing more than 20,000 rooms. The four developments provide about five rooms each for over 4,000 families—enough dwelling units to house the entire population of a city of nearly 20,000 people.

Naturally, in buildings like these it is necessary for the sake of initial economy to rule out frills and embellishments. But never forget that the vital need for long-range economy dictates *highest quality in every basic element of construction.*

That is why only the best heating equipment is used in the four big central heating systems. That is why the systems are equipped throughout with thousands of Marsh Radiator Valves and Traps—the kind that will stand up across the years.

Yes, in buildings of every size and kind you will find Marsh Valves, Traps and Vents . . . selected by men who know the economy of using only the best. Let the Marsh man work with you on your next job.

MARSH HEATING EQUIPMENT CO. *Sales affiliate of Jas. P. Marsh Corporation* **Dept. T, Skokie, Ill.**

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Newark's big scale housing

The four projects—three of them completed and fully tenanted—provide homes for 4,374 families in the 20,681 rooms of 18 12-story; 13 8-story, 1 7-story, and 5 3-story buildings. The project is described as:

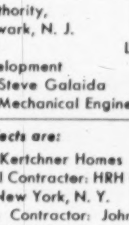
Housing Authority,
City of Newark, N. J.
David Kent, Dir. of Development
Louis Danzig, Exec. Dir.
Steve Galaida, Mechanical Engineer

The projects are:

1. Otto E. Kertchner Homes
   General Contractor: HRH Construction Co., New York, N. Y.
   Heating Contractor: John H. Joyce, Newark, N. J.
2. Archbishop Thos. J. Walsh Homes
   General Contractor: Terminal Construction Co., Wood Ridge, N. J.
   Heating Contractor: John Cooney, Harrison, N. J.
3. Rev. William P. Hayes Homes
   General Contractor: Terminal Construction Co., Wood Ridge, N. J.
   Heating Contractor: Paramount Plbg. & Htg. Corp., New York, N. Y.
4. Christopher Columbus Homes
   General Contractor: Terminal Construction Co., Wood Ridge, N. J.
   Heating Contractor: Paramount Pblg. & Htg. Corp., New York, N. Y.

The Christopher Columbus group of 8 12-story buildings is not illustrated, but is now completed.

The great combination: Marsh packless—*truly packless*—radiator valve and the trouble-free Marsh thermostatic trap.

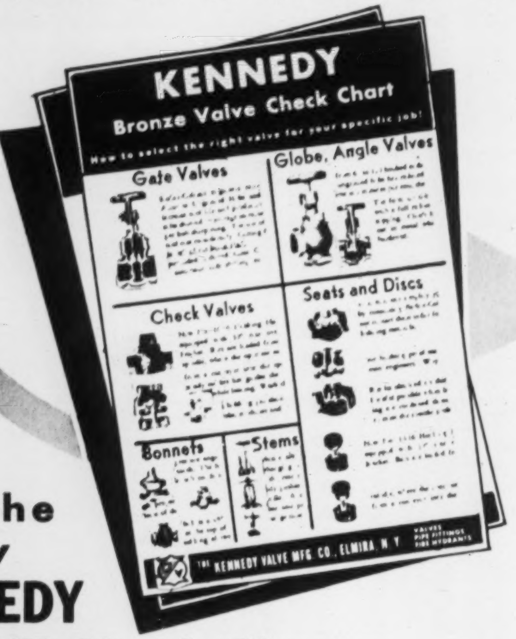


The Marsh float and thermostatic trap. There is a Marsh trap for every heating service.

MARSH *Quality Heating Specialties* **SINCE 1865**

KENNEDY

gives you the answers to your Valve questions . . .



with the New KENNEDY VALVE Check Charts . . .

show you at a glance *How, When, Where* to use the correct valve to fit the job!

Now you can tell at a glance the correct KENNEDY Valve to use on a specific job . . . and why! These new valve Check-Charts show you the important features of the various types of KENNEDY Valves and explain their proper installation and use. Show you which valves go where . . . list specific Figure Numbers for accurate selection . . . describe why that valve should be used . . . and even suggest additional uses for Kennedy Valves.

One chart describes Kennedy Bronze Valves and its companion chart lists uses and conditions for Iron-Body Valves.

Designed for fast, easy reference, contains the answers to most of your valve questions. Large enough (16½" wide x 25" deep) for easy reading and hangs right on your wall in your office or shop.

Here are long-needed valve Check-Charts that give you quick, correct information and show you how and why certain valves are built for specific jobs. Get your Kennedy Valve Check-Charts today!

• GET YOUR KENNEDY VALVE Check Charts NOW! . . . ask your nearest KENNEDY Distributor or WRITE direct.

THE KENNEDY VALVE MFG. CO.
1021 E. WATER ST. ELMIRA, NEW YORK
• VALVES • PIPE FITTINGS • FIRE HYDRANTS
OFFICE-WAREHOUSES IN NEW YORK, CHICAGO, SAN FRANCISCO • SALES REPRESENTATIVES IN PRINCIPAL CITIES

RECENT TRADE LITERATURE

Continued

uum pumps, including four-wing type, two-wing type, double cylinder type, motor driven models, integral pump and motor, air motors, line of accessories. *Leiman Bros., Dept. HPAC, 102 Christie St., Newark 5.*

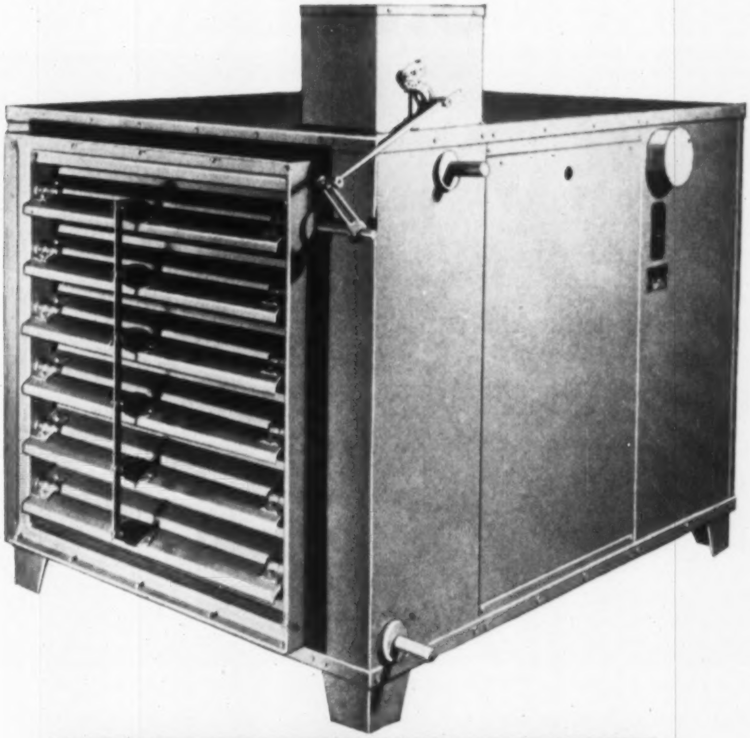
▶ *VERTICAL SCALE INDICATOR*—Bulletin 7702 describes "Tel-O-Set" vertical scale indicator. Recent information on recorders, controllers also included. Instruments designed to measure, control process variables such as temperature, pressure, flow, liquid level. *Minneapolis-Honeywell Regulator Co., Industrial Div., Dept. HPAC, Wayne and Windrim Aves., Philadelphia 44.*

▶ *WATER TREATMENT*—Entitled "High-Rate and Conventional Water Treatment Plants," technical reprint T-141 is economic analysis of subject. Illustrated article contains 10 different case histories. Graph compares plant capacity and cost for both types of plant. *Graver Water Conditioning Co., Dept. HPAC, 216 W. 14th St., New York 11.*

▶ *RUBBER PRODUCTS*—New 8 page bulletin AD 147 describes company's line of "Silicone" rubber products. Lists features. Details various styles, their uses. *Garlock Packing Co., Dept. HPAC, Palmyra, N.Y.*

▶ *DEHUMIDIFICATION, REFRIGERATION*—Reprint tells how brewery made effective use of combination of direct dehumidification and mechanical refrigeration. Discusses how control of temperature and humidity is attained simultaneously, economically. *Kathabar Div., Surface Combustion Corp., Dept. HPAC, Toledo 1.*

▶ *WATER SOFTENERS, FILTERS*—New 85 page manual covers heavy duty, industrial and domestic water softeners and chemical feed pumps. Includes fill-in type specifications. *Bruner Corp., Dept. HPAC, 4763 N. 32nd St., Milwaukee.* ⌗



Now... Better Year 'Round Refrigeration

NEW MARLO AIR COOLED CONDENSERS

Offer

- **Fully automatic control of refrigerant flow**
- **No Water Needed**
- **Convenient, outdoor installation**

By maintaining liquid pressure in refrigerant lines for proper flow through lines and valves, the new Marlo Air Cooled Condensers permit full capacity operation of refrigeration units at all seasons.

The modulating sensing control device for controlling may be located either in the air stream or in a high side liquid line.

Propeller and Centrifugal Fan Types with full capacity performance and realistic ratings.

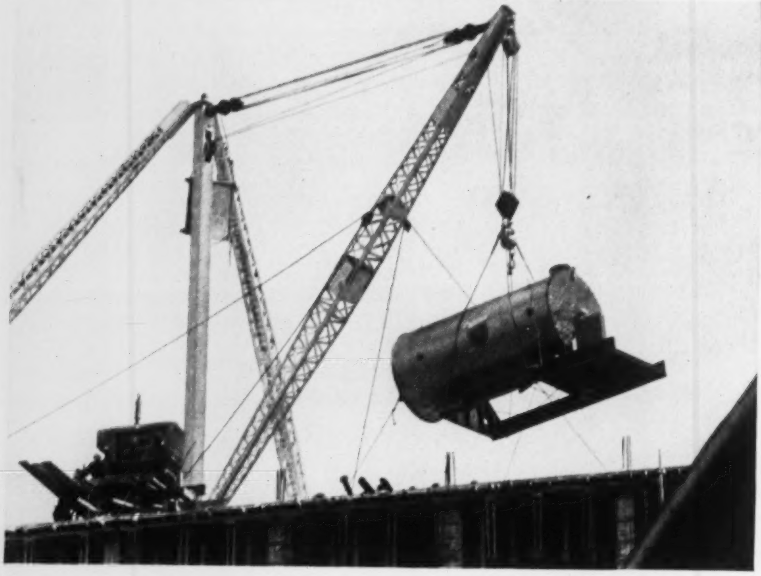
Write for Bulletin 5155. You may contact Marlo Representatives, located in principal cities, or our factory.

MARLO coil co.

SAINT LOUIS 10, MISSOURI

Quality Air Conditioning and Heat Transfer Equipment Since 1925

KORFUND
VIBRATION CONTROL



1500 Massachusetts Ave. Corp.—Owner
Ring Engineering Co.—Builder
F. Wallace Dixon—Architect
Karsunky, Weller & Gooch—Consulting Engineers
Standard Engineering Co.—Mechanical Contractor

lets you

PUT 'EM ON THE ROOF!

The roof, or an upper floor, is the best place for heating and air conditioning equipment, keeps basements free for other revenue-producing uses such as parking, storage, etc.

Korfund Vibration and Noise Control units let you install heavy boilers, compressors, fans, etc., without transmitted vibration to floors below. The photograph shows a boiler being hoisted to the roof of the 8-story 1500 Massachusetts Ave. apartments in Washington, D. C. The completed installation, which included Korfund-mounted boilers, pumps, compressors and fans, has been in operation for well over a year now, and the tenants on the floor immediately below don't even know of the existence of the equipment immediately over their suites.

This is just another example of the effectiveness of Korfund units. Their efficiency did not come about by accident — it's the result of more than a half-century of experience in the vibration and noise control field. Why not put this experience to work for you?

Write for a copy of the booklet, "Air Conditioning Goes Up in the World," which describes Korfund's role in vibration and noise-free upper floor installations. We'll also include a copy of "Vibration Control Specifications for Air Conditioning Equipment." Ask for Bulletin 31.

For specific recommendations contact us or one of the 46 local Korfund offices. Look under "Korfund" in your local Telephone Directory or in Thomas' Register.

THE **KORFUND** CO., INC.

KORFUND VIBRATION CONTROL
SPRINGS RUBBER CORK

48-01F Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

WHO'S WHAT

Continued

(*New personnel, promotions*)

▶ *REFLECTAL CORP.*—Raymond G. Nordstrom, vice president and general manager. Mr. Nordstrom joined Reflectal as general manager in March 1954.

▶ *CONSULTING ENGINEERS ASSOCIATION OF CALIFORNIA*—Ralph M. Westcott, president for 1956. He is a member of the consulting firm of Holladay & Westcott, Los Angeles.

▶ *WORTHINGTON CORP.*—Herbert Wolf, chief engineer of air conditioning and refrigeration research and development.

▶ *TUTHILL PUMP CO.*—James Tuthill, president. Mr. Tuthill succeeds H. T. Kessler, retired.

▶ *O. A. SUTTON CORP.*—Paul Best, manager of newly organized original equipment division to develop sales of motors, coils and component parts to other manufacturers.

▶ *SHAW-PERKINS MFG. CO.*—John L. Schlafhauser, treasurer.

▶ *STODDARD INDUSTRIES, INC.*—James Blanton, general sales manager.

▶ *CRANE CO.*—Frank F. Elliott, elected to board of trustees of Illinois Institute of Technology. Mr. Elliott is president of Crane.

▶ *WESTINGHOUSE ELECTRIC CORP.*—James W. Wilcock, general sales manager for Sturtevant Div.

▶ *AMERICAN AIR FILTER CO., INC.*—William H. Treffinger, manager of Morrison, Ill. plant of Herman Nelson Div.

▶ *ACME INDUSTRIES, INC.*—Lawrence J. Bonhotal, service manager.

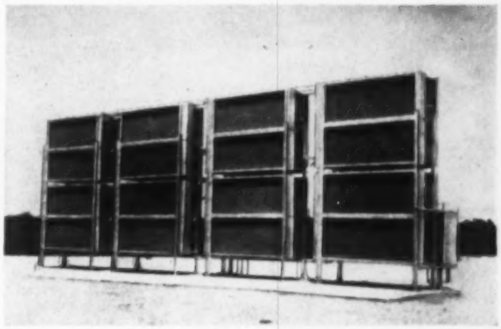
100 TON BARRIER

Crashing the 100 ton barrier

with KRAMER

UNICON

in semi-tropical climate



UNICON SUCCESSFULLY MET THE TEST THROUGH THE SEVERE SUMMER OF 1955

You, too, can crash the big tonnage barriers with UNICON, the industry's finest remote-type air-cooled condenser. Put Kramer's 18 years of "treasured know-how" in the proper use of air as a condenser coolant to work for you.

Photo of Kramer UNICONS mounted on roof of Handy-Andy Supermarket in San Antonio, Texas, used with 100 ton air conditioning system. Supplied through United Supply Co., of San Antonio and installed under the direction of Harold Vogt.

Write for Bulletin U-210-L

100 TON BARRIER

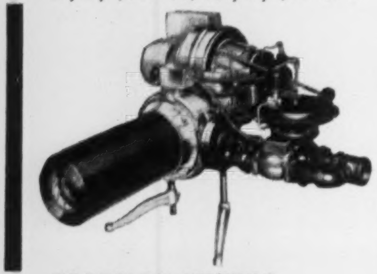
KRAMER

KRAMER TRENTON COMPANY
Trenton 5, New Jersey

WALNUT DAIRY FARMS

"SYNCRO-FLAME BURNER CUT OUR FUEL BILL $669.35 IN ONE MONTH"

Writes Mr. H. P. Easley, Walnut Dairy Farms, Waterloo, Iowa. "We converted a 25 HP and 30 HP boiler to Synchro-Flame Gas-Oil burner and the savings seem almost too good to be true. We cut our fuel bill in January '55 by $819.20, February by $607.38, July by $669.35."



FACTS ON SYNCRO-FLAME GAS-OIL BURNERS

- **7 Models.** 100,000 to 4,600,000 BTU's per hour on gas. 1 to 33 Gals. per hour on oil. Boiler Horsepower 2 to 100.
- **Burns any gas.** Natural, mfg., mixed and L.P.
- **Burns light oil.** Number 1 to 3.
- **Efficient.** The Syncro-Flame Combination Gas-Oil Burner is not a compromise. Automatic damper control guarantees maximum burning efficiency on either fuel.
- **Automatic or Manual.** Either manual switchover or can be set to switch over automatically from gas to oil (or reverse) at any given temperature by hook-up to an outside thermostat.
- **Easy to install.** Only 5 electrical connections necessary. Complete control panel factory wired and tested to meet any local code at no extra cost.
- **UL listed & approved.** Every Syncro-Flame Gas-Oil burner has Underwriter's Laboratories label. Also approved by State of Mass. Fire Marshal, cities of Omaha, St. Louis and Minneapolis. (N. Y. City pending.)
- **FEATURES:** Automatic Electric Ignition. Electronic Safety controls-positive automatic shut-off if flame or power go out. Patented Firing Head—prevents flame-outs and pulsation. Larger models have two stage firing and prepurge and post purge programming.

Manufacturers of U.L. Approved Gas Burners, Oil Burners and Dual-Fuel Burners ranging in capacity from 1 to 100 BHP, 100,000 to 4,600,000 BTU/hr.

FOR SPEC. SHEETS, PRICES, WRITE:

→ **SYNCHRONOUS FLAME INC.**
BOX 335-C, WALWORTH, WIS.

engineered excellence

syncro DUAL GAS-OIL BURNER flame

WHO'S WHAT

Continued

▸ *LIQUIDOMETER CORP.*—Louis M. Campani, chief administrative engineer; Julius V. DiFranco, chief electrical engineer; P. Richard Rosenberg, chief mechanical engineer; Edgar Astrove, administrative assistant, engineering department; Edward Chowske, supervisor of industrial engineering group.

▸ *RAYBESTOS-MANHATTAN, INC.*—John McKinlay, assistant sales manager, packing division.

▸ *REFRIGERATION ENGINEERING, INC.*—Albert Rebel, president of Recold International Corp., the company's newly formed organization for sales outside of the United States.

▸ *JOSEPH T. RYERSON & SON, INC.*—Scott Vrooman, assistant manager of sales for Chicago plant.

▸ *READING TUBE CORP.*—Heinz H. Biel, a director. Mr. Biel is a partner in a New York investment banking firm.

▸ *REFRIGERATION AND AIR CONDITIONING CONTRACTORS ASSN. NATIONAL*—Officers elected for 1956 are: Dudley M. Cawthon, president; William D. Moody, first vice president; Harvey O. Miller, second vice president; Lee J. Quinn, recording secretary; Harvey W. Hottel, treasurer; Paul B. Hughes, sergeant at arms. Directors elected for two years are: Charles Caccamo, Lawrence E. Gardella, George T. Howe, R. B. Garlock, Mr. Quinn, Armand Cowan, O. B. Lund.

▸ *RHEEM MFG. CO.*—Leo F. Givens, comptroller.

▸ *A. O. SMITH CORP.*—L. H. Hoelter, manager of builder sales department.

Specify Raypak

Copper tube forced hot water boilers

...with exclusive gas modulation—sizes the boiler for the job!

Approved by A.G.A.

Complies with A.S.M.E. code

12 Models fit every need

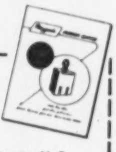
Check these features

Raypak boilers are specifically packaged for Radiant Panel, Baseboard, Radiator, Convector, Swimming Pool and Volume Hot Water Supply Systems and also are ideal companions to Air Conditioning Units.

1. Original "Plug-in" Boiler
2. 100% copper waterways last a lifetime
3. Triple the BTU's per pound of weight
4. Remarkably compact and durable
5. Laboratory tested at 2,000 psi—no failure

Raypak's skilled and specialized distributors and representatives are available any time for consultation on any wet heating problem.

Raypak

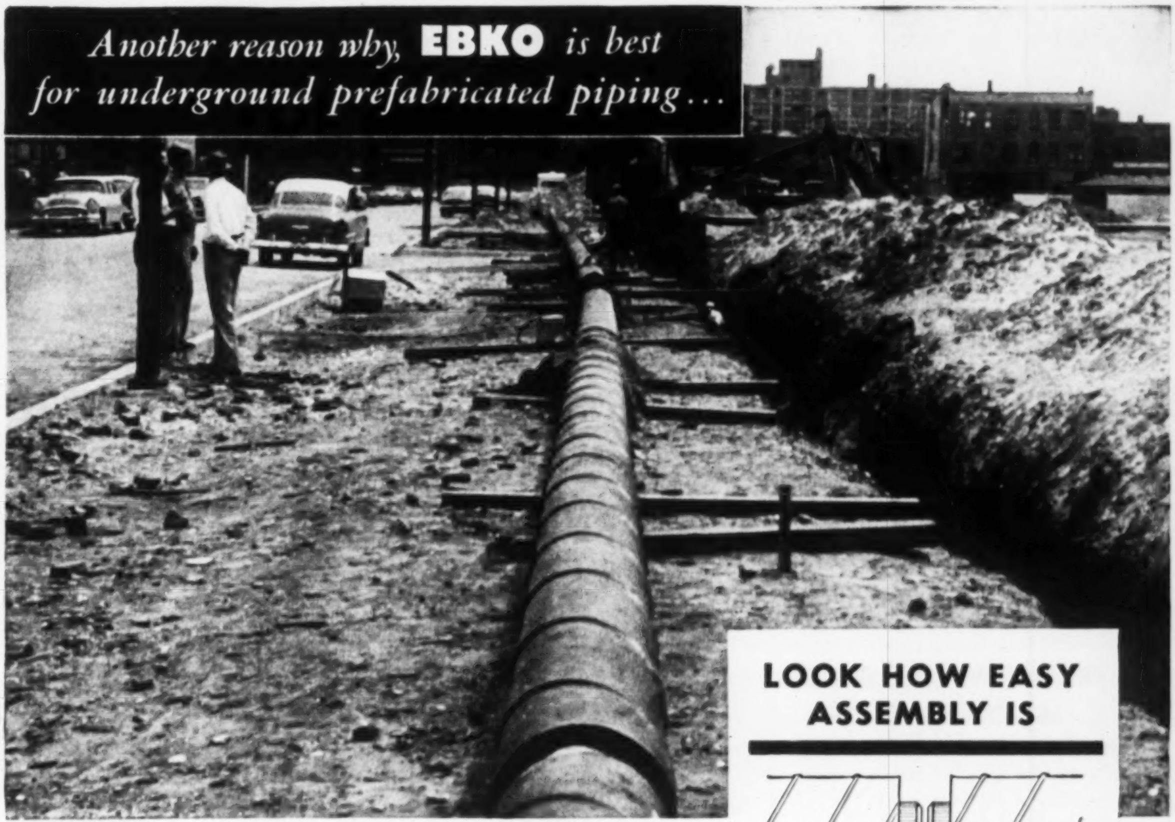


RAYPAK COMPANY, INC.
Engineers-Manufacturers
2416 Chico Avenue
El Monte, California
Dept. H-3

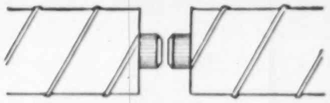
Please send me additional information and name of local representative.

Name__________
Occupation__________
Company__________
Address__________
City__________ State__________

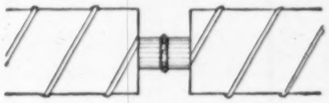
Another reason why, **EBKO** *is best for underground prefabricated piping...*



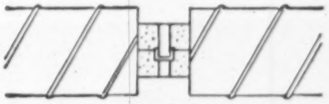
LOOK HOW EASY ASSEMBLY IS



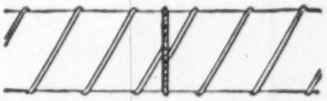
1. Place pipe on lubricated blocks beside the trench.



2. Align inner pipes, pull together, weld and then test for leaks.



3. Apply split insulation and band in place.



4. Pull casing together, weld and test.

EBKO systems are the easiest to install

A complete EBKO prefabricated insulated underground piping system can be installed in less time and with less work than other prefabricated systems. Here's why:

A plan layout accompanies every system with all pipe, fittings and accessories plainly marked. All parts are shipped in the order of their installation. Beside-the-trench-assembly and 14 gauge *minimum* steel casing strength eliminates necessity for wide or deep trenches. Note on right, simple assembly requires only welding and application of insulation and the welders work upright for the majority of welds.

. . . and remember, *only* EBKO provides steel casing with the Ebko-lok® seam that imparts further crush resistant strength to the casing for positive impact protection.

See your local EBKO Representative—let him show you *all* the reasons for EBKO's superiority or write for details — no obligation.

© 1955, E. B. Kaiser Co

Cast Iron
Steel

EBKO

Underground and Overhead Prefabricated Piping Systems

E. B. KAISER CO.
Since 1890
2118 West Lake Avenue • Glenview, Illinois
Phone: Glenview 4-4500

For STEAM • CONDENSATE • HIGH TEMPERATURE and CHILLED WATER • REFRIGERANTS • GASES • ETC.

STRONGEST FASTENATION

at Hollywood and Vine...

A dozen floors above the street, in America's new Tower of Music, this workman anchors steel channel as easily as squeezing a trigger—driving fasteners straight, deep and powerfully into solid concrete with the RAMSET® DUO-JOBMASTER.

Complete flexibility with

DUO-JOBMASTER

Both ¼″ and ⅜″ fasteners are set with the same tool, the new RAMSET DUO-JOBMASTER. It's the famous RAMSET tool with two interchangeable barrels—to handle *every* fastening job with any style or length fastener.

THE CAPITOL TOWER, spectacular new home of hi-fi Capitol records, dominates the heart of Hollywood, California.

First circular office building in the world, it was designed by architect Welton Becket; contractor is C. L. Peck. The $2 million structure is 13 stories high, acoustically engineered for minimum sound disturbance; has underground reverberation chambers with foot-thick concrete walls buried 25 feet into the earth.

NEED A KILN GUN?

Designed to dislodge clinker rings from rotary kilns, Western's Kiln Gun (now sold by Ramset) removes all types of stubborn, inaccessible obstacles. Write for complete details.

No matter what the construction problem, if it requires fastening to steel or concrete, RAMSET will do it better, faster, cheaper. Ask for new free catalog, just ready for you.

Ramset Fastening System
WINCHESTER-WESTERN DIVISION
OLIN MATHIESON CHEMICAL CORPORATION

12109-C BEREA ROAD • CLEVELAND 11, OHIO

WHO'S WHAT

Continued

▶ *TYPHOON AIR CONDITIONING CO.*—Mark E. Mooney, chairman of the air conditioning industry's campaign for the 1956 greater New York $3 million appeal of the National Foundation for Infantile Paralysis. Mr. Mooney is vice president of Typhoon.

▶ *UTILITY APPLIANCE CORP.*—Stanley F. Skafte, elected to the board of directors. Mr. Skafte is manager of the company's heating and air conditioning division.

▶ *SQUARE D CO.*—Dr. John D. Leitch, vice president-engineering; Alvin C. Dyer, vice president and general manager of Electric Controller and Mfg. Co., a division.

▶ *ROBERTS-GORDON APPLIANCE CORP.*—William L. Wright, Jr., sales engineer.

▶ *OLIN MATHIESON CHEMICAL CORP.*—William R. Kelty, Jr., manager of Ramset Fastening System.

▶ *POWERS REGULATOR CO.*—Harald C. Mueller, alumni representative on Illinois Institute of Technology board of trustees. Mr. Mueller is president of Powers Regulator.

▶ *OIL-HEAT INSTITUTE OF AMERICA, INC.*—Elected to membership in the manufacturing division: Delta Heating Corp., Rheem Mfg. Co., Lincoln Furnace Co., Reif-Rexoil, Inc. In the accessory division: Sid Harvey, Inc., Soreng Products Div. of Controls Corp. of America, Revcor, Insul-Lyte Corp. (Div. of Plibrico Co.)

▶ *SORENG PRODUCTS DIV. OF CONTROLS CORP. OF AMERICA*—Willis W. Mansfield, director of manufacturing.

SIL–FOS brazed tubing is on the march!

Important new buildings in the news, point up the steadily growing swing to silver brazing of non-ferrous pipe and tubing systems with the low-temperature silver brazing alloy SIL-FOS.

The reasons are plain when you consider the decisive importance of the three principal benefits of SIL-FOS brazing:

1. The tremendous savings in weight through the use of lightweight tubing SIL-FOS brazing makes practical—with corresponding reduction in cost of pipe and its handling and supporting.

2. The substantial amount of assembly time-labor-cost saved by elimination of threading.

3. The fact that a SIL-FOS brazed installation is permanently leak-tight and maintenance-free.

Minimizing of turbulence and vibration and elimination of "creep" are among the many other vital advantages.

ROCKEFELLER CENTER

All hot and cold water lines and auxiliary lines to water coolers in the new U. S. Rubber Co. building just added to the Center, are SIL-FOS brazed. WALSEAL fittings were used. They come with SIL-FOS inserts.

ARCHITECT: *Harrison & Abramovitz*
GENERAL CONTRACTOR: *George A. Fuller Co.*
PLUMBING CONTRACTOR: *C. H. Cronin, Inc.*

With SIL-FOS brazing much more of the tubing can be fabricated on the bench. Other photo shows 6" tube with WALSEAL fitting.

Architects —
General Contractors — Plumbing Contractors

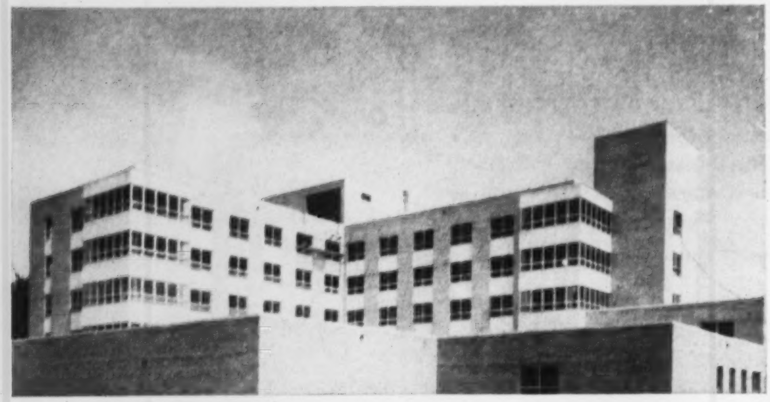
The full facts are most convincing. A field service engineer will give them to you at your call. *For information in print* write for the SIL-FOS pipe brazing bulletins. Also send for our distibutor list — it shows the nearest source of supply.

HANDY & HARMAN

General Offices: 82 Fulton St., New York 38, N. Y.
DISTRIBUTORS IN PRINCIPAL CITIES

OFFICES and PLANTS
Bridgeport, Conn. • Providence, R. I. • Chicago, Ill. • Cleveland, Ohio
Detroit, Mich. • Los Angeles, Calif. • Toronto, Canada • Montreal, Canada

New hospital saves $50,300



100%-fresh-air cooling brought within reach by KoolShade Sunscreen

—7,430 ft. of screening cuts load by 74 tons!

Of the many features of Memorial Hospital, Savannah, Ga., none is more outstanding than its unusual air conditioning. It is primarily a 100%-fresh-air system!

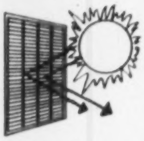
Clearly superior to recirculating systems, 100%-fresh-air cooling has one problem: it requires far greater refrigeration tonnage. Hence it was economically imperative that Memorial seek out every practical means of reducing the load.

KoolShade Sunscreen — applied on south, east and west windows — was chosen immediately . . . and no wonder!

By controlling the solar heat transmission through glass, KoolShade actually reduced tonnage requirements by 74 tons! (Comparison: 2 inches of wall insulation was "worth" 72 tons.) Dollar savings, over and above the installed cost of the Koolshade, amounted to an estimated $50,300! And of course the building will continue to benefit from the lowered operation and maintenance costs.

Thus another great building proves it pays to *investigate* KoolShade Sunscreen!

Only Koolshade Sunscreen offers



- **unsurpassed shading efficiency** — keeps up to 87% of the sun's rays off windows during the hottest parts of the day: frees air conditioning systems from "hot spot" over-loads, gives relief from heat and glare, protects furnishings from sun-fading.
- **84% clear visibility** — better than with ordinary insect screening.
- **harmony with all architecture**
- **excellent insect protection** — no other screens needed on open windows.
- **virtually no maintenance** — strong metal fabric fully weatherized . . . never needs paint . . . lasts for years . . . withstands hard blows.

Send today

for this detailed and illustrated bulletin. And for expert help in cutting costs and sun problems, just request a call from a KoolShade engineer. No obligation or charge.

Distributor franchises still open in many communities for those who qualify.

118-55

KOOLSHADE
Sunscreen

BW

REFLECTAL CORPORATION
A subsidiary of Borg-Warner Corp.
310 S. Michigan Ave., Dept. K-2,
Chicago 4, Ill.

ALFOL INSULATION

INGERSOLL ROOF DECK

WHO'S WHAT

Continued

▸ *BOUND BROOK OIL-LESS BEARING CO.*—Harold O. Johnson, chairman of the board and treasurer; William R. Toeplitz, president; Samuel S. Connor, vice president and secretary. Mr. Toeplitz fills the vacancy created by the recent death of William F. Jennings.

▸ *ACRO MFG. CO.*—R. V. Clark, sales manager for new products division.

ALLEGHENY LUDLUM STEEL CORP.—Edward Kister, head of architectural section of application and development division.

▸ *AMERICAN AIR FILTER CO., INC.*—Robert J. Wright, staff engineer for dust control department. He will be located in Cleveland.

▸ *ALLIS-CHALMERS MFG. CO.*—Willis G. Scholl, executive vice president.

▸ *UNION ASBESTOS & RUBBER CO.*—L. H. Kramer, general manager of heating and cooling division.

▸ *STILLWATER CLAY PRODUCTS CO.*—R. Patrick Turner, manager of conduit division.

▸ *VIKING AIR PRODUCTS DIV., NATIONAL-U.S. RADIATOR CORP.*—George O. Gould, chief executive engineer; John M. Morton, advertising manager, the post held by Mr. Gould prior to his advancement.

▸ *WILLIAM WALLACE CO.*—D. G. Harmon, secretary.

▸ *WORTHINGTON CORP.*—Elston J. Tribble and Aloysius M. Tullo, vice presidents.

▸ *YEOMANS BROS. CO.*—Arthur D. Swift, secretary.

CORROSION RESISTANT VINYL PIPE IS LIGHT WEIGHT, EASILY JOINED

PIPE OF B. F. GOODRICH CHEMICAL RIGID GEON CUTS INSTALLATION TIME

CORROSION resistant rigid vinyl plastic pipe, made from B. F. Goodrich Chemical Company's Geon resin, was installed recently in an Oklahoma oil field to handle crude oil in a water-flood system. Located in Alluwe Field, northeast of Tulsa, the rigid Geon vinyl pipe is used as a gathering line to join 20 oil wells to a main three-inch vinyl line leading to the tank battery.

It takes two men just one hour to join 640 feet of this corrosion resistant rigid vinyl pipe. This compares to three or four hours that it takes to install comparable steel pipe or ten-hours for cement-lined pipe.

One man places the pipe in position and cleans any moisture and dirt from the ends of the pipe. The other applies the solvent cement with a brush and the two men push two pipes together in a slip-sleeve fitting. The whole joining operation takes less than a minute for each section.

The usual steel pipes failed in this case in three years from sulfur and salt corrosion. Geon rigid vinyl is immune to galvanic corrosion—and highly resistant to both salt water and sour crude oil. Greater fluid flow of rigid vinyl pipe reduces operating pressures. The line carries 6,000 to 7,500 barrels per day here.

For further information on the many uses of Geon vinyls, please write Dept. DN-2, B. F. Goodrich Chemical Company, Rose Bldg., Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Rigid Geon vinyl pipe connects to a brass valve at wellhead. These feeder lines then lead into the 3-inch main line. About 6100 feet of 1½ inch and 1200 feet of 2-inch pipe in 11 lead-in lines join 20 oil wells in this system. About 1800 feet of 3-inch pipe was used for the main line.

Pipe is joined easily by using slip-sleeve fittings and solvent cement. It takes less than a minute to assemble and push together, and obtain a snug fit for each 20-foot section.

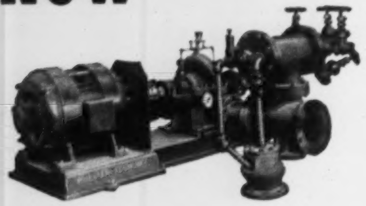
No mechanical equipment is necessary to install lightweight rigid vinyl pipe. This 20-foot section of 3-inch vinyl pipe weighs 19 pounds compared to 150 pounds for a similar length and diameter of steel pipe.

Geon
Polyvinyl Materials

GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable.

GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

PROVIDE FOR FIRE PROTECTION NOW



with a

WHEELER-ECONOMY FIRE PUMP

A delay in the planning or completion of your fire protection program may mean loss of life, property or operation. For a complete and effective plan include one or more Underwriters Laboratory and Factory Mutual Fire Insurance Companies approved Wheeler-Economy Fire Pumps.

Write for catalog L-154

WE-910

WHEELER-ECONOMY

ECONOMY PUMPS, INC. • DIVISION OF
C. H. WHEELER MANUFACTURING CO.
19TH AND LEHIGH, PHILADELPHIA 32, PA.

WHO'S WHAT

Continued

▸ *ELECTRO DYNAMIC DIV., GENERAL DYNAMICS CORP.*—Raymond B. Carey, Jr., assistant division manager-manufacturing.

▸ *GENERAL ELECTRIC CO.*—Robert C. Wilson, manager-marketing for distribution assemblies department.

▸ *HOOKER ELECTROCHEMICAL CO.*—Thomas E. Moffitt, executive vice president and a director; R. Wolcott Hooker, senior vice president; John F. Snyder, to assume wider responsibilities in company management; Dr. Jay C. Searer, production manager; Lother A. Sontag, technical manager; George E. Patterson, North Tonawanda, N.Y. plant engineer; Peter F. Casella, manager of patent section of research and development department; Clark R. Simmons, advertising manager; A. Vaughan Chinnock, assistant advertising manager-chemicals; Wallace H. Kinz, assistant advertising manager, plastics.

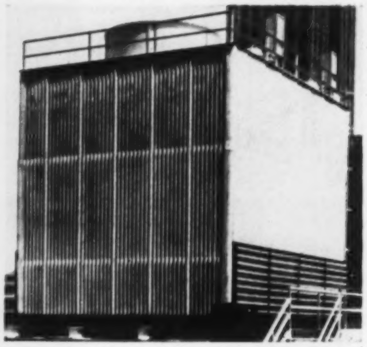
▸ *JOY MFG. CO.*—John Lawrence, president and chief executive officer; W. L. Wearly, executive vice president; H. C. Nyquist, vice president, general sales. J. D. A. Morrow has retired as president and has been elected chairman of the board.

▸ *KLING BROS. ENGINEERING WORKS*—Joseph M. Dorocke, general sales manager.

▸ *LENNOX INDUSTRIES, INC.*—Norman Ray Garrett, added to sales organization.

▸ *LEWYT AIR CONDITIONER CORP.*—Bernard Grill, chief product engineer.

▸ *DELTA HEATING CORP.*—Norman M. Emslie, chief design engineer; William T. Goldsmith, marketing manager and product research director; Thomas A. Temple, office manager.

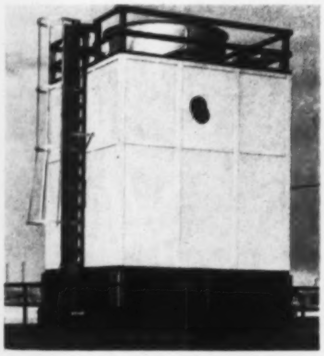


The Phillips Transite Cooling Towers have been in operation over nine years and proven to furnish the required cooling with lowest possible maintenance cost. Phillips Towers are available with framing of California Redwood or Hot Dipped Galvanized Steel as preferred.

The new Phillips nailless fill adds to simplicity of erection and maintenance.

The Phillips eliminator system guarantees minimum drift loss.

When you have a cooling problem call your Phillips representative.



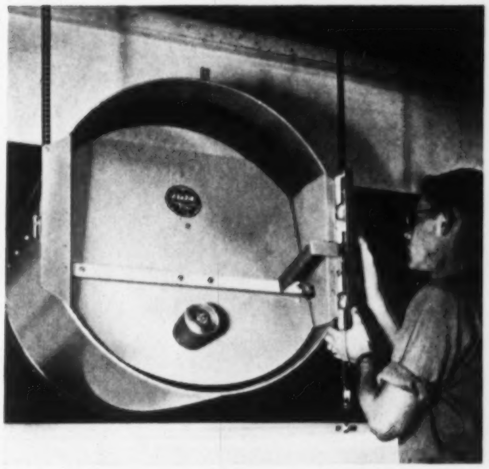
Phillips Cooling Tower Co., Inc.
220 DUPONT ST., BROOKLYN 22, N. Y.

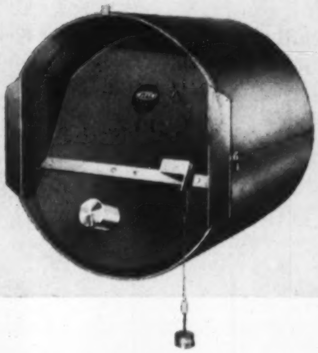
DEPENDABLE, PRECISELY ACCURATE

Draft Control

for coal fired, oil fired, gas fired or gas-oil fired

HEATING PLANTS





FIELD TYPE "M" for coal and oil fired heating plants

Heavy duty commercial model in 28" and 32" sizes. Heavy, rigid construction assures long, trouble free service. Stainless steel knife edge bearing for permanent sensitivity. Also available in 6" through 24" sizes for domestic and commercial installations. First choice of heating men — the round control you can level on any flue.

FIELD TYPE "MG" for gas and gas-oil fired heating plants

A heavy duty, precision built control in sizes 8" through 32" for commercial and industrial installations. Stainless steel knife edge bearings for permanent sensitivity. Gate opens inward to regulate updrafts, and outward to relieve down-drafts. Optional safety switch available where codes require. Fully proven, accepted virtually everywhere.

They're real HEAVYWEIGHTS

Compare the weight of a Field Control to any other available. Here is proof of the massive, welded construction, long, vibration-free service, that permits Field's supreme accuracy.

Size Control	Thickness of Parts Gate	Side Plates	Ring	Collar	Wt. without Crtn. or Crate
14 M	16 Ga.	16 Ga.	3/16 x 2"	22 Ga. Galv.	19 #
16 M&MG	16 Ga.	16 Ga.	3/16 x 2"	18 Ga. Galv.	28 #
18 M	16 Ga.	16 Ga.	3/16 x 2"	18 Ga. Galv.	35 #
20 M&MG	16 Ga.	16 Ga.	1/4 x 2"	18 Ga. Galv.	41 #
24 M&MG	14 Ga.	16 Ga.	1/4 x 2"	18 Ga. Galv.	65 #
28 M&MG	14 Ga.	14 Ga.	1/4 x 4"	14 Ga. H.R.S.	110 #
32 M&MG	14 Ga.	14 Ga.	1/4 x 4"	14 Ga. H.R.S.	140 #

field

FIELD CONTROL DIVISION

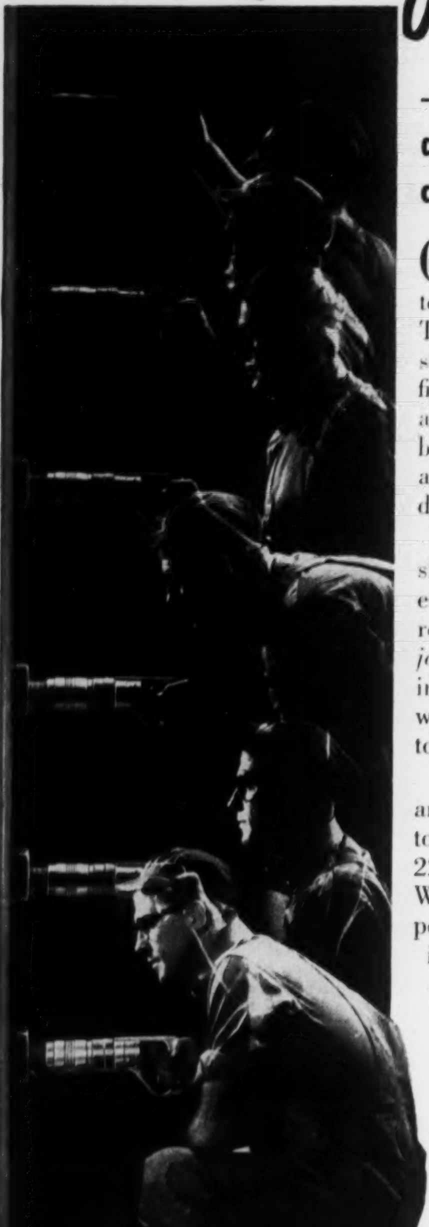
of H. D. CONKEY & COMPANY, Mendota, Ill.

Affiliates

Conco Building Products, Inc. - Brick, Tile, Stone

Conco Materials Handling Division - Cranes, Hoists

ONE MAN-
ONE TOOL-
ONE MINUTE-



—and 6 fastening studs are securely set in concrete or steel!

GIVE A MAN the Remington Stud Driver and that fastening job's practically done! This compact tool sets up to 6 studs per minute . . . anchors fixtures to concrete or steel with a squeeze of the trigger. It sets both ¼" and ⅜" diameter studs arrow-straight — with no predrilling required.

Change-over from one stud size to the other is quick and easy. Operator can change barrels in 90 seconds, *right on the job*. There's no time lost in going from medium- to heavy-duty work — no need for a second tool.

There are 40 different styles and sizes of Remington Studs to choose from and a variety of 22 and 32 caliber power loads. With studs and cartridges in pocket, Remington Stud Driver in hand — you're ready for *every* stud-fastening job. Find out how the tool saves time and money in fastening wood sleepers, furring strips, metal window frames and other fixtures by mailing coupon below.

REMINGTON
STUD DRIVER

Remington

DU PONT

STUD DRIVER

Industrial Sales Division HPAC 3
Remington Arms Company, Inc.
Bridgeport 2, Conn.

Please send me your free booklet which shows how I can speed the job and save with the Remington Stud Driver.

Name __________ *Position* __________
Firm __________
Address __________
City __________ *State* __________

WHO'S WHAT

Continued

▸ *ALUMINUM ASSN.*—C. A. Macfie, director at large to serve three years. Mr. Macfie is president of Revere Copper and Brass, Inc.

▸ *AIRTEMP DIV., CHRYSLER CORP.*—R. L. Forsberg, comptroller.

▸ *CRANE PACKING CO.*—Karl Rohlen, president of the Skokie Valley, Ill., Industrial Assn. Mr. Rohlen is president of Crane Packing.

▸ *CARRIER CORP.*—Howard N. Eggleston, national construction manager.

▸ *COPELAND REFRIGERATION CORP.*—Raymond G. Mozley, chief applications engineer; Charles A. Lessing, chief laboratory engineer.

▸ *DEAN PRODUCTS, INC.*—M. W. Ehrlich, staff member of Thermo-Panel Div.

▸ *C. A. DUNHAM CO.*—Edward G. Jepson, advertising manager.

▸ *AMERICAN BLOWER CORP.*—Herbert E. Barth, executive vice president; Edwin W. Peterson, vice president in charge of sales.

▸ *AMERICAN STANDARDS ASSN.*—H. Thomas Hallowell, Jr., president; Van H. Leichliter, vice president.

▸ *BERGER FURNACE CORP.*—W. F. Winter, sales representative.

▸ *NEW YORK AIR BRAKE CO.*—John G. Wood, a director.

▸ *DELAVAN MFG. CO.*—W. Eugene Sinner, project engineer.

DURIRON
DURIRON
DURIRON

SYMBOLS OF PERMANENCE

DURIRON® ACIDPROOF DRAIN PIPE

Duriron generally will outlast the building in which it is installed. Duriron resists practically all commercial acids and other corrosive solutions. Duriron is the one high silicon iron pipe specified for more than 30 years by architects and engineers for corrosive waste disposal systems. A complete line of Duriron pipe and fittings is stocked by leading wholesalers throughout the country.

THE DURIRON COMPANY, INC., DAYTON, OHIO

DURIRON
LOOK FOR THE NAME ON EVERY PIECE

WHO'S WHAT

Continued

▶ *MINNEAPOLIS-HONEYWELL REGULATOR CO.*—Dean Randall, advertising manager for company's division located at Minneapolis.

▶ *D. J. MURRAY MFG. CO.*—L. L. Duncan, sales manager of unit heater and mill supply division.

▶ *MANNING, MAXWELL & MOORE, INC.*—J. Robert Kelley, president. He succeeds Hamilton Merrill, who has retired after 35 years with the company.

▶ *MISSION APPLIANCE CORP.*—C. A. Miller, sales manager for heating and air conditioning.

▶ *MIDWEST PIPING CO.*—Phil R. Becker, general manager of sales.

▶ *MODINE MFG. CO.*—Don F. Morse, general manufacturing manager; Arthur B. Arnold, consulting engineer-manufacturing division.

▶ *NORTH AMERICAN INDUSTRIAL ENGINEERS, INC.*—Alan J. Bronold, vice president.

▶ *CENTURY ELECTRIC CO.*—Frank E. Nutt, sales promotion manager. He succeeds Anthony Neher, retiring.

▶ *CLEVELAND FUEL EQUIPMENT CO.*—O. A. Reiter, advertising and sales promotion manager.

▶ *COLEMAN CO., INC.*—Alvin B. Newton, vice president in charge of all phases of company's design and research activities. Mr. Newton succeeds Boyd W. Tullis, retired.

IN THE TERRITORIES . . .

(Recent sales appointments)

▶ *WESTINGHOUSE ELECTRIC CORP.*—Somers, Fitler and Todd Co., distributor in greater Pittsburgh area; Industrial Supply Division of Forest Products Co., Montana, Idaho distributor.

▶ *JOSEPH T. RYERSON & SON, INC.*—William K. Underhill, sales manager for Connecticut plant. Changes in sales personnel at Los Angeles plant are: Loren B. Clay, manager of tubular products and cold finished bar sales; John R. Fennie, assigned to Inglewood, Gardena, Compton sales district; J. W. Stevens, to cover Santa Monica, Culver City, West Los Angeles, Beverly Hills areas.

New compactness in air-cooled AIR CONDITIONER design!

Smallest air-cooled, self-contained (not remote) 5-ton central type unit made.

5 natural wood-grain finishes available on all free-standing models.

Completely automatic, thermostat controlled, air-cooled condenser.

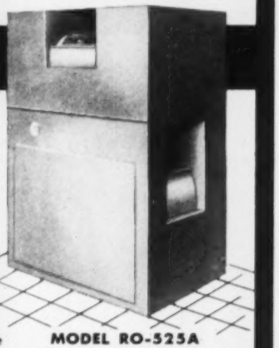
MODEL RO-525A
(with air distribution head)

MODEL NO.	NOMINAL CAPACITY	TOTAL COOL. B.T.U.	COOLING C.F.M.	OUTSIDE DIM.
FL-2	2 Ton	24,000	900 @ .3 S.P.	30Wx21Dx43H
RO-26	2 Ton	24,000	1000 @ .3 S.P.	30Wx21Dx34H
RO-31	3 Ton	36,000	1200 @ .2 S.P.	30Wx23Dx38H
RO-31 H P	3 Ton	37,700	1400 @ .3 S.P.	30Wx25Dx40H
RO-525 A	5 Ton	65,500	1800-2400 @ .3 S.P.	40Wx26Dx57H

Thermostat has 3 positions: Continuous — Automatic, Fan & Compressor — OFF.

Complete air conditioning for entire home — or equivalent commercial or office area — at the lowest cost in smallest space! GENERAL AIR CONDITIONERS deliver 2, 3 or 5 tons of cooling. All models operate on standard outlet (220 V, single and 3 phase except 2-ton — single phase only).

Attic, roof, outside, or free-standing units



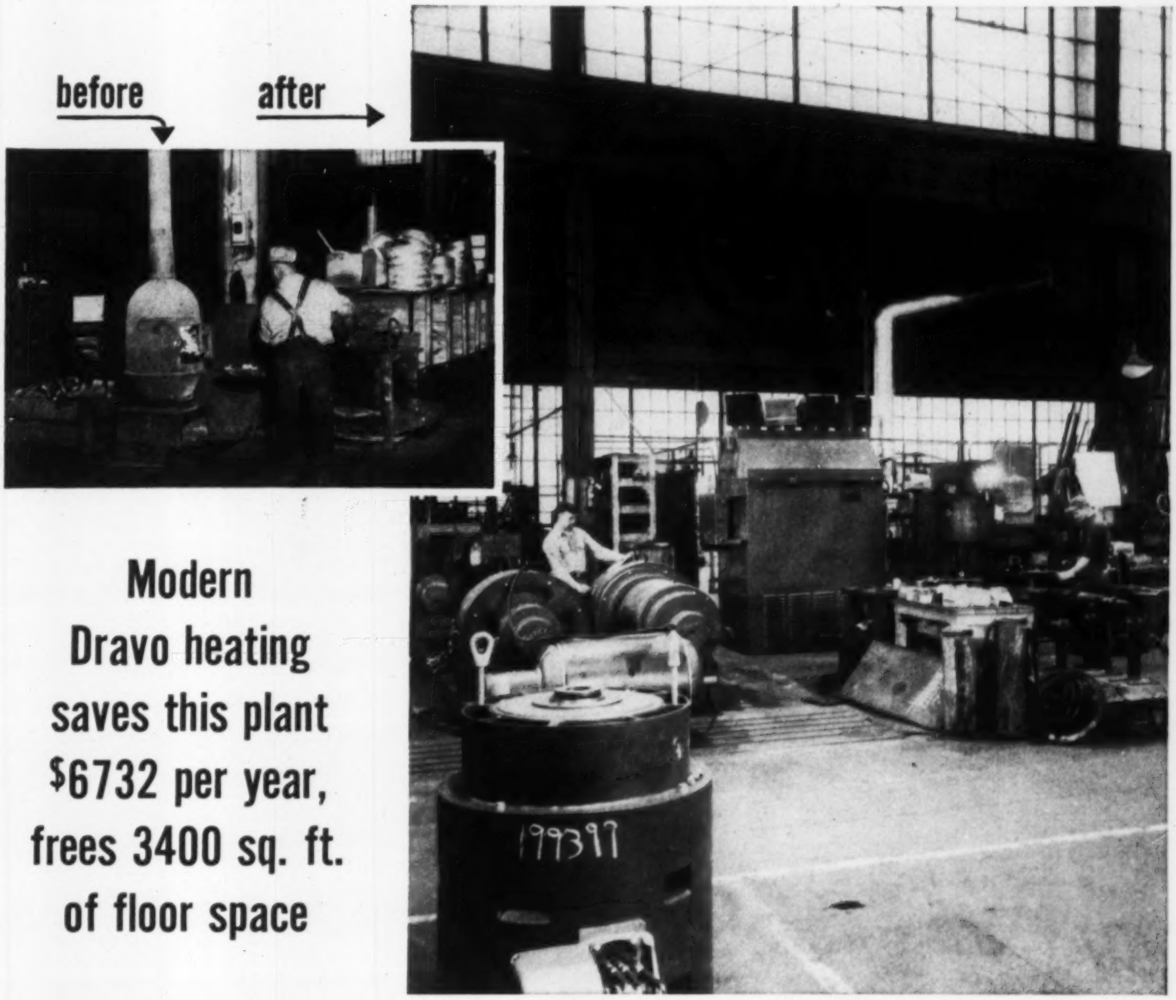
NATIONWIDE SALES AND SERVICE
Offices and warehouses:
LOS ANGELES • ATLANTA
BOSTON • CHICAGO
CLEVELAND • HOUSTON
KANSAS CITY • MIAMI
NASHVILLE • NEW YORK
PHILADELPHIA
SAN FRANCISCO • SEATTLE
ST. LOUIS • TAMPA

WRITE today for details. Franchise dealerships available.

MODEL RO-525A
(without air distribution head)

Main Office
GENERAL AIR CONDITIONING CORP.
Dept. S-21 • 4542 E. Dunham St.
Los Angeles 23, California

FIVE YEAR GUARANTEE — easy payment plan



Modern Dravo heating saves this plant $6732 per year, frees 3400 sq. ft. of floor space

Sharp increases in heating costs traveled hand-in-hand with growth and expansion at Ideal Electric and Manufacturing Company's Mansfield, Ohio plant.

As manufacturing additions went on over the years, more and more hand-fired coal stoves were employed to heat new areas. Until recently, heating for the seven-acre plant area was handled by thirty-two such units. Heating problems never seemed to cease. With the lack of uniformity in heating, workers either froze or baked. Coal and labor costs (it took almost the full time of 5 men to fire stoves around the clock) never stopped climbing. Stoves and their bins gobbled up more than 4000 square feet of plant space!

When modern Dravo gas-fired, forced-air space heaters were installed, these problems disappeared, and the savings were immediate and substantial. Since eleven Dravo "Counterflo" heaters provided comfortable heat everywhere in the plant areas, 3400 square feet of valuable space was released ("Counterflo" heaters required only 600 square feet). But, more important was the actual gross savings of $6732 made possible last winter, '54-'55, through the use of these Dravo Heaters. When amortizing this new and standby equipment over a 10 year period, a net savings of $2735 per year is realized!

Remarkable? Then you will want to see for yourself what unusual cost-savings and heating efficiency Dravo heaters can bring to your heating systems. Use the coupon below to get complete details. You'll find it always pays to investigate Dravo Heaters!

Dravo Corporation, Department A-1403
Fifth & Liberty Avenues
Pittsburgh 22, Pa.

I am interested in Dravo Heaters for __________

☐ Please send literature
☐ Please have representative call

Name __________

Company __________

Address __________

City __________ Zone _____ State _____

DRAVO
CORPORATION
Pittsburgh 22, Pennsylvania
Representatives in all principal cities

WHO'S WHAT

Continued

▶ *KENNARD CORP.*—New sales representatives are: R. C. Black Co., Rochester, N.Y.; R. E. Burden & Son, Rockford, Ill. A-T-M Gas Equipment Co., Jackson, Miss.

▶ *LENNOX INDUSTRIES, INC.*—Appointments at Columbus, Ohio division are: Harold De Long and Allen Creekbaum, air conditioning field managers; Allen Georgenson, sales promotion manager; James T. Meara, assistant sales manager; Deane Tonkin, manager of market research and statistical department; Ray O. Allison, sales correspondent.

▶ *SURFACE COMBUSTION CORP.*—Schultz-Forster Assoc., Inc., representative for Kathabar Air Conditioning Div. in Syracuse area.

▶ *TENNEY ENGINEERING, INC.*—John A. Green Co., sales engineering representative in the Southwest.

▶ *TRANTER MFG., INC.*—Meters and Controls, Inc., Chicago district representative for Platecoil Div.

▶ *TUBE TURNS*—L. J. Morris, assistant district manager at Pittsburgh; T. T. Thompson, added to Pittsburgh sales staff.

▶ *UNION ASBESTOS & RUBBER CO., HEATING AND COOLING DIV.*—A. L. Hospers, southern regional sales manager; Sweiger-Davidson Co., Chicago metropolitan sales representative.

▶ *W-S FITTINGS DIV., H. K. PORTER CO.*—Bernard R. Molitor, representative in Pittsburgh district.

▶ *WEBSTER ELECTRIC CO.*—Mervin W. Sarchet, sales engineer for oil hydraulics division in the Midwest.

▶ *WOLVERINE TUBE DIV. OF CALUMET & HECLA, INC.*—George Overstreet, representative in new office at Charlotte.

▶ *WAGNER ELECTRIC CORP.*—Herbert B. Nechemias and John K. Oliver, manager of electrical division branch offices at Cincinnati and Portland, Ore., respectively.

▶ *YORK CORP.*—Adams Distributors of Rhode Island, Inc., room air conditioner distributor for Providence.

Specify **WHITLOCK CONVERTORS**

THEY'RE EASY TO INSTALL AND MAINTAIN!

The design details of Whitlock Type R Convertors have been highly approved by consulting engineers. The side outlet water connections greatly simplify installation and maintenance. The U-tube bundle can be readily removed when required. Also, the water connections when 5" and larger are *flanged* as are also all steam connections 4" and larger — extremely helpful in the field.

You'll find information concerning our complete line of Convertors . . . with tables to help you select the size you want . . . in our Bulletin No. 62. If you don't have a copy of this handy reference book, write to us today.

Whitlock

THE WHITLOCK MANUFACTURING COMPANY
44 South Street, West Hartford 10, Conn.
In Canada Darling Brothers, Ltd., Montreal

INSTANTANEOUS HEATERS • STORAGE HEATERS • FUEL OIL HEATERS
WATER CHILLERS

Cancer and healthy cells seem to feed on different kinds of "food." We know how to make some cancer cells die by starving them. Will we starve out all kinds of cancer cells one day? Only more work and research will tell.

Some cancer patients develop substances that fight their own tumors. When science knows more about antibodies, we may have a new cancer treatment. Only more work and research will tell.

Some cancers are being halted by atomic materials. Can new radioactive isotopes affect other cancers in the same way? Only more work and research will tell.

New drugs are being developed that fight specific kinds of cancer. Will any of them turn out to be cancer-killers? Only more work and research will tell.

Some good news about cancer

. . . and how you can make the news better

These photographs illustrate some of the work our scientists are doing in the fight against cancer. Just one thing is needed to keep this research going. Your help. If you—and all of us—give today, the research will go on until we conquer our greatest enemy—cancer. Help fight cancer with your check. Give generously. Send your contribution to CANCER, c/o your town's Postmaster. AMERICAN CANCER SOCIETY.

It's time for a *Change!*

NOW the modern way is Radiant Cooling!

Cooling for human comfort has come a long way—and now has made the greatest advance of all to provide cooling by nature's method—true Radiant Cooling.

Remember the clammy, health endangering conditions set up by the early air cooling systems—but, still a welcome relief from summer's heat. Then came control of humidity, but still tremendous volumes of cold air were employed, with the inherent high cost of equipment and ducts to say nothing of objectionable and annoying drafts.

Now cooling for human comfort is accomplished by absorbing sensible heat by direct radiation. It is an integral feature of the B/M Radiant Panel Ceiling and functions to absorb the heat radiated from the surfaces and room occupants to naturally cool those surfaces and establish a degree of comfort never before attained mechanically. The Burgess-Manning Radiant-Acoustical Ceiling has obsoleted all other systems of cooling and heating and provides, in addition, an acoustic control second to none.

Learn the facts—write for full information.

Ask for Bulletin A-138-H

Architectural Products Division of

BURGESS-MANNING COMPANY

5970 Northwest Highway, Chicago 31, Ill.

Manufacturers of 3-Way Functional Ceilings and Acousti-Booths for Telephoning

WHO'S WHAT

Continued

▶ *LEWYT AIR CONDITIONER CORP.*—New distributors and the territories they will serve are: Allied Electric Distributing Co., western Pennsylvania, eastern Ohio, northern West Virginia, parts of Maryland; Stern Bros., Cleveland, northeastern Ohio; Harry F. Haldeman, Inc., southern California, Las Vegas; Pioneer Appliance Co., northern California, Reno.

▶ *MARLO COIL CO.*—George Miller, representative for Denver area.

▶ *MORRIS MACHINE WORKS*—J. C. Cary, sales engineer in New York office to serve that city, northern New Jersey, Long Island; J. E. Kennard, Florida representative.

▶ *MUELLER CLIMATROL DIV., WORTHINGTON CORP.*—Sales promotions are: Elmore T. Scheck, regional sales manager of Wisconsin, northern Illinois, upper Michigan; M. H. Thomas, regional sales manager over Indiana, Ohio, western Pennsylvania, most of Michigan; Richard B. Schmidt, Milwaukee area sales manager; Chester J. Vopal, manager of traffic and warehousing; Fred Heise, manager of repair parts department.

▶ *MINNEAPOLIS-HONEYWELL REGULATOR CO.*—New sales engineers and the branch offices to which they are assigned are: William Bater and Robert W. O'Reilly Philadelphia; David B. Beasley, Toronto; Walter E. Biewer and Robert E. Day, Los Angeles; Robert J. Byers, Milwaukee; A. P. Ciprari, international division, New York; Alan L. Colter, Buffalo; John L. Dyer, Cincinnati; Merton H. Fischer, international division, Minneapolis; Michael N. Francher, Syracuse; Eugene D. Haugen, Seattle.

Also named are: Charles C. Hulsey, Columbia; Charles B. MacRae, Houston; Robert J. Owen, Cleveland; John B. Prouty, Columbus; Harvey F. Renee, Indianapolis; Bertram R. Robinson, Union; Russell W. Skinner, Pittsburgh; Jack D. Stickley, Oklahoma City; Richard E. Swenson, Twin City.

▶ *MUELLER BRASS CO.*—Henry G. Hendrix, assigned to Los Angeles territory.

▶ *PEERLESS MFG. CORP.*—Lester L. Crahan, West Coast representative.

▶ *ROBERTSHAW-FULTON CONTROLS CO.*—M. R. Gilbert, Jr., district manager for heating controls division in Chicago area.

❶

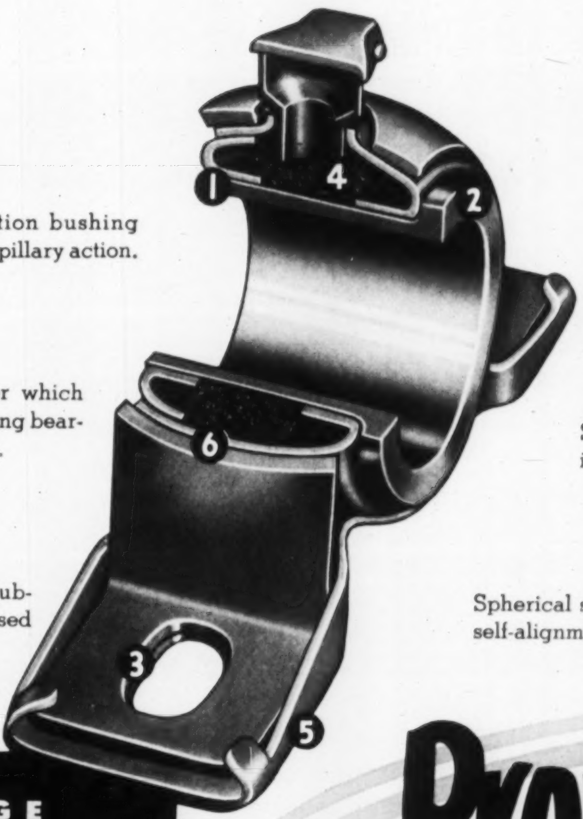
Self-oiling composition bushing feeds oil to shaft by capillary action.

❷

Bushing has shoulder which provides self-lubricating bearing surface for collar.

❸

Slotted Bolt Holes. Rubber grommets can be used for sound isolation.



❹

Absorbent filler holds oil in reservoir and prevents over-lubrication.

❺

Split Pressed Steel Housing is light and strong.

❻

Spherical surfaces provide full self-alignment.

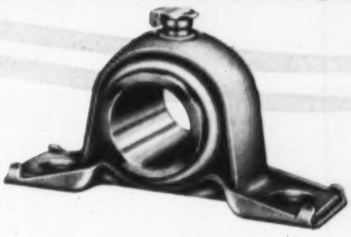
DODGE

Bronzoil

FAN AND BLOWER BEARINGS

Proved

in Millions of installations!



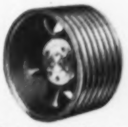
Engineered to meet the specialized requirements of fan and blower service, Dodge Bronzoil bearings are widely and successfully used on small shafts for general service, within the limits of their capacity. Capillary bronze bushing has a capacity of one-third its volume in oil. The liberal oil reservoir, with close fitting wick, surrounding the bushing provides ample lubrication. Millions of Bronzoil bearings have proved their dependability through years of service. Available in shaft sizes from 3/4" to 1 1/4". Write now for literature and detailed information.

DODGE MANUFACTURING CORPORATION, 1600 Union St., Mishawaka, Ind.

DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory-trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone book.

Dodge-Timken Bearings

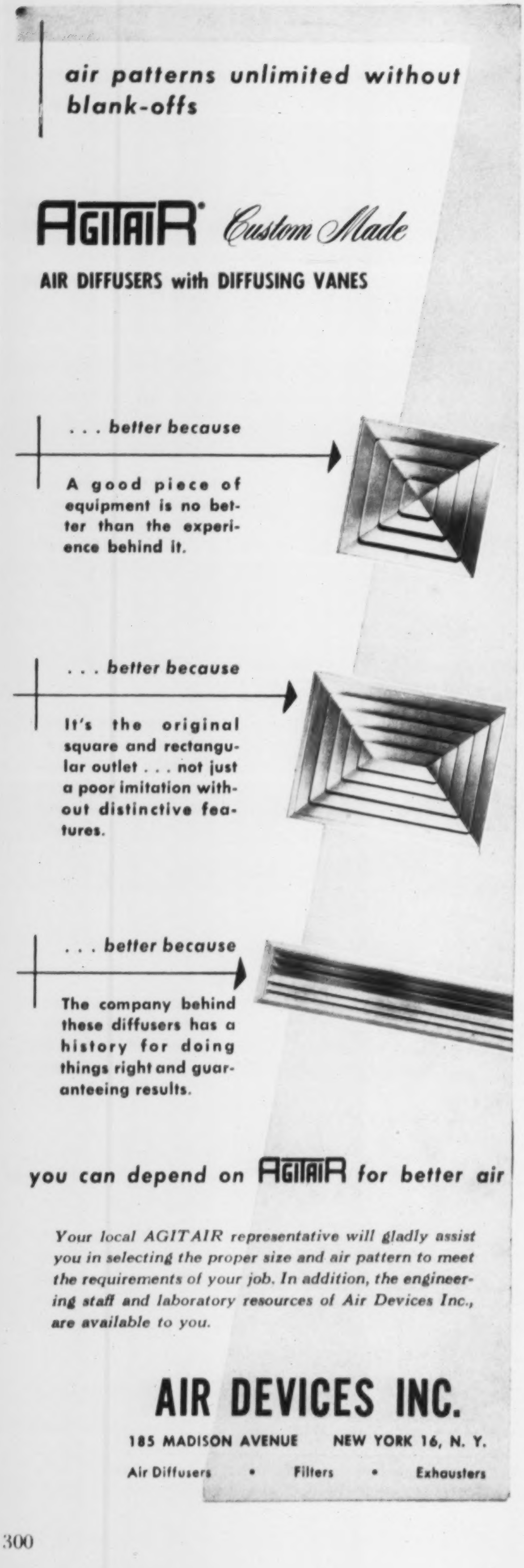


Taper-Lock Sheaves

Sealed-Life V-Belts

NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY,
CHICAGO THRIFT-ETCHING CORPORATION, 1555 N. SHEFFIELD AVENUE, CHICAGO 22, ILLINOIS



air patterns unlimited without blank-offs

AGITAIR® Custom Made

AIR DIFFUSERS with DIFFUSING VANES

. . . better because

A good piece of equipment is no better than the experience behind it.

. . . better because

It's the original square and rectangular outlet . . . not just a poor imitation without distinctive features.

. . . better because

The company behind these diffusers has a history for doing things right and guaranteeing results.

you can depend on AGITAIR for better air

Your local AGITAIR representative will gladly assist you in selecting the proper size and air pattern to meet the requirements of your job. In addition, the engineering staff and laboratory resources of Air Devices Inc., are available to you.

AIR DEVICES INC.

185 MADISON AVENUE NEW YORK 16, N. Y.

Air Diffusers • Filters • Exhausters

WHO'S WHAT

Continued

▶ *ALLMETAL SCREW PRODUCTS CO., INC.*—Julian Leventhal, sales manager of new West Coast division offices at Los Angeles.

▶ *EMERSON RADIO AND PHONOGRAPH CORP.*—Morton M. Tillman, eastern regional sales manager of company's air conditioning division.

▶ *ELECTRO DYNAMIC DIV., GENERAL DYNAMICS CORP.*—Lloyd Van Buskirk, Jr., Detroit district manager to serve the Michigan area.

▶ *EDWARD VALVES, INC.*—Earl N. Stone, assigned additional territory of North and South Dakota. He already covered most of the Rocky Mountain area.

▶ *FEDDERS-QUIGAN CORP.*—L. H. Appliance Wholesalers, distributor in Pittsburgh area.

▶ *FOXBORO CO.*—E. W. Prendergast, regional manager of southeast territory; R. F. Sutton, transferred to Pensacola, Fla. as sales engineer; F. J. Stevens, Jr., industrial engineer to work out of Lakeland, Fla. branch; H. C. Craig, transferred to Jacksonville as branch manager; L. C. Estes, industrial engineer assigned to Atlanta branch; G. W. Reed, Jr., manager of New Orleans office; J. K. Younkins, manager at Charleston, W. Va. Industrial engineers joining the company and the offices to which they are assigned are: W. H. Rhyne, Chattanooga; T. A. Jones, Charlotte; M. N. Walker, Knoxville.

▶ *FLEXONICS CORP.*—Thermo Tech Products Co., representative for Colorado, southeastern Wyoming.

▶ *GENERAL CONTROLS CO.*—George A. Williams, Jr., manager of Detroit factory branch; R. C. Servat, manager of Houston branch; Byron B. Spinney, regional representative in New York office.

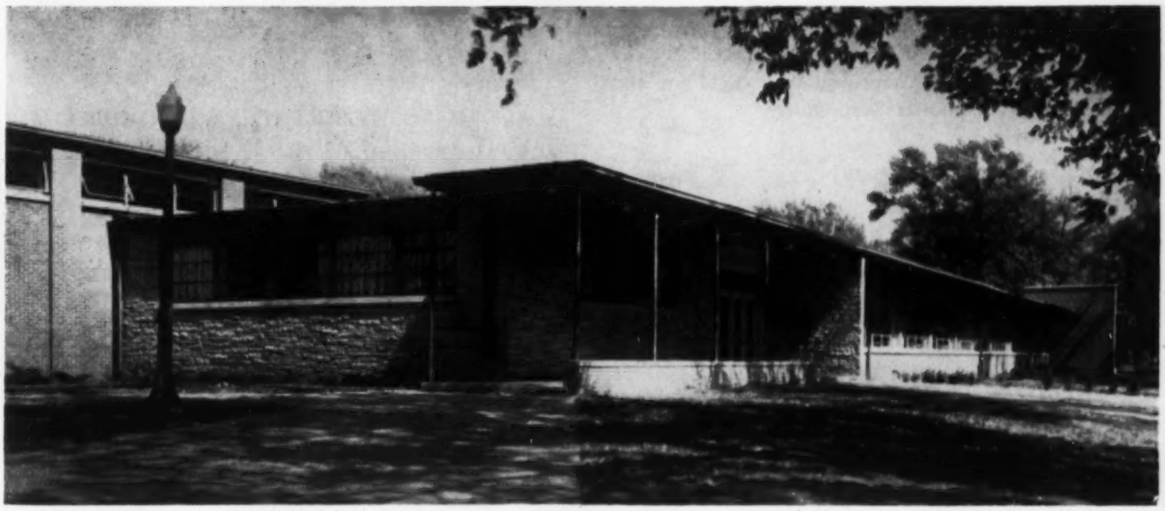
▶ *HALSTEAD & MITCHELL*—Robert M. Nelson, district sales engineer for northern Illinois, northern Indiana, western Michigan.

▶ *HEIL CO.*—Speakman Co., Wholesaler for several counties in Delaware.

▶ *K S M PRODUCTS, INC.*—F. G. Kern, engineer in new district office at San Francisco. He will supervise stud welding distributors in Washington, Oregon, Nevada, Idaho, Utah, Colorado, Wyoming, Montana.

WARM AIR HEATED...

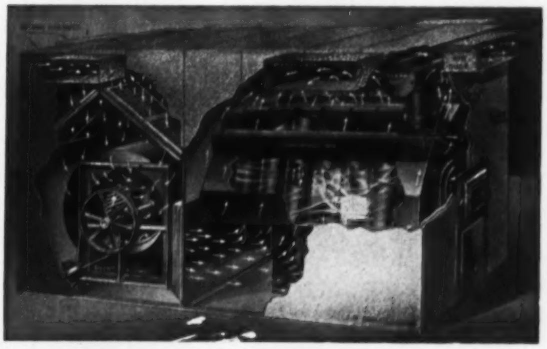
by Campbell



Elementary School Building, Humboldt, Iowa, warm air heated with a Campbell 8250 stoker fired unit. Architect, Smith-Voorhees-Jensen-Silletto & Associates; Consulting Engineer, Paul A. Walters; Heating Contractor, Backman Sheet Metal Works, all of Des Moines.

HEATING ECONOMY & COMFORT

Warm air heating of large, multi-room buildings is both practical and economical with Campbell 8000 Heaters. The outstanding efficiency of these Campbell Heaters assures quick abundant heat with exceptional fuel economy. Units are easily installed, surprisingly low in cost. Let Campbell heating engineers help you with layouts and specifications on your next large heating job.



MANUFACTURERS' AGENTS

We have a number of attractive openings for manufacturers' agents who call on heating contractors, engineers and architects. If interested, please state territory you cover.

CAMPBELL HEATING CO.
Des Moines 17, Iowa
I am interested in your proposition for manufacturers' agents.
My territory covers ....
Name ....
ADDRESS ....
CITY .... ZONE .... STATE ....

CAMPBELL HEATING COMPANY

Des Moines 17, Iowa

WHO'S WHAT

Continued

▶ *BLACK, SIVALLS & BRYSON, INC.*—James F. Myers, responsible for all operations in eastern sales region; Walter Whetstone, district manager of Philadelphia sales territory; Austin I. Lyon, John Vossler and Richard A. Cwik, district managers of New York, Buffalo and Chicago districts, respectively.

▶ *BRUNER CORP.*—Warren Rademacher and Aetna Engineering Co., sales representatives for Iowa and New England territories, respectively.

▶ *CLARK CONTROLLER CO.*—Robert E. Peterson, district application engineer for Pittsburgh office.

▶ *CONOFLOW CORP.*—Raymond Jensen, sales engineer for George W. Chipley Co., Conoflow's Wisconsin representative.

▶ *THERMO-PANEL DIV., DEAN PRODUCTS, INC.*—Barrett-Christie Co., representative for northern Illinois, northern Indiana.

▶ *DOLE VALVE CO.*—Robert E. Burns, representative for sales and service in New England.

▶ *KINETIC CHEMICALS DIV., E.I. DUPONT DE NEMOURS & CO., INC.*—Robert E. Sangston, sales supervisor for eastern district; James B. Gray, transferred to Atlanta territory; Frederick H. Fryer, assigned to central district as technical sales representative; Robert E. Thomas, Jr., office manager in Los Angeles district of company's organic chemicals department.

▶ *ANSUL CHEMICAL CO.*—Glen Iams, in charge of new Memphis branch office.

▶ *AUTOMATIC TEMPERATURE CONTROL CO., INC.*—William B. Parker, Jr., Chicago district manager.

▶ *AUTOMATIC SWITCH CO.*—Leen's Electric Motor Service, distributor for Maine; Equipment Sales Co., Akron area distributor.

▶ *AMERICAN RADIATOR & STANDARD SANITARY CORP.*—Chester A. Brunner, district sales representative for air conditioning division in Buffalo area.

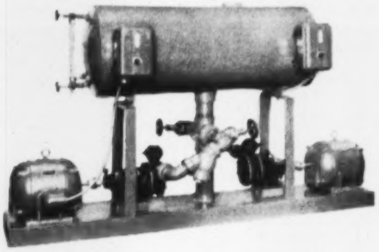
▶ *BRUNNER MFG. CO.*—John T. Yates, district manager for newly formed Michigan sales territory.

EAGAN BOILER FEED PUMP ASSEMBLIES

Are

PRE-Packaged to Prevent POST-Delivery Troubles

They Combine the Function of Boiler Feeding and Fresh Water Make Up



EAGAN boiler feed pump assemblies provide a dual service — boiler feeding and fresh water make up. They handle capacities up to 100,000 sq. ft. at 200 psi . . . are made in single and duplex models. On these pumps, the receiver is located in a raised position. The advantage? To prevent flashing when traps leak.

Pumps and motors on all EAGAN boiler feed pump assemblies are located in line so that the assemblies can be maintained easily and placed out-of-the-way against the wall. In addition, gate valves in the suction line of each pump permit shut down of one for service while the other is operating.

Check on all the features and advantages of EAGAN Pre-Packaged Boiler Feed Pumps — pumps that perform right . . . right from the start. Just fill in the coupon and we'll send additional details on these practical units or our other line of pumps.

WALTER H. EAGAN CO., INC.

pump specialists since 1920

2337 Wallace Street
Philadelphia 30, Pa.

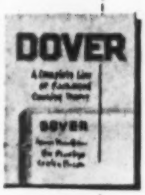
Send me information on the EAGAN pumps checked:

——Condensate——Boiler Feed——Centrifugal——Turbine
——Fuel Oil Pump & Heater Sets

Name ....
Address ....
City .... Zone ...... State ....

SEND FOR YOUR **FREE** CATALOG TODAY

Here is an illustrated, descriptive 12-page catalog that will give you all the facts and specifications on Dover towers. And it's yours absolutely FREE . . . no obligation whatsoever! Just fill in and mail the coupon. That's all!



DOVER MFG. CO., Inc.
Dept. 100, 3117 Weatherford Ave.
Independence, Missouri

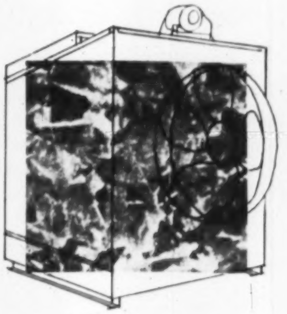
☐ Please send me my copy of the Dover Complete Line 12-page Catalog.
☐ Please send me the name of my nearest Dover representative.

Name____
Firm____
Address______________________________________
City____________________ Zone____ State________

In Its Complete Line of Packaged Cooling Towers,

DOVER AND ONLY DOVER

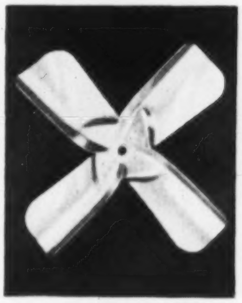
Gives You All These EXTRA FEATURES at NO EXTRA COST



HOT-DIP GALVANIZING

for Longer Life

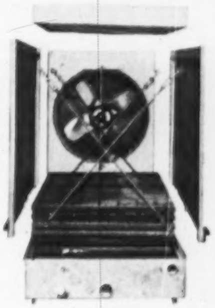
All metal parts on Dover cooling towers are hot-dip galvanized *after* fabrication. This heavy zinc coating eliminates costly rust and corrosion problems. You pay nothing extra for this rugged finish — standard on all Dover towers.



STAINLESS STEEL FANS

Stop Fan Failures

Every Dover horizontal induced draft cooling tower (Series CF) is equipped with a stainless steel propeller fan and shaft. The savings in maintenance alone, with this distinctive Dover feature, makes Dover the most economical tower you can buy.



"TAKE-APART" FEATURE

Enables Installation In Hard-to-Reach Spots

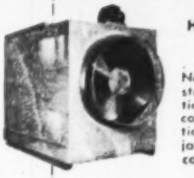
Basement or other "hard to get at" locations are no longer a problem! By virtual elimination of bolts, all Dover towers can be taken apart rapidly and reassembled right on the job site. Unique design, using adjustable tie-rods, makes this possible.

DOVER . . . AMERICA'S NEW STANDARD FOR PACKAGED COOLING TOWERS

WHATEVER YOUR COOLING TOWER NEEDS . . . THE ANSWER IS DOVER

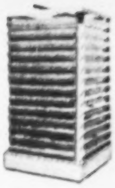
Series V
VERTICAL INDUCED DRAFT TOWER

. . . with centrifugal blower. Ideal for those installations where space is a factor. Piping is held to a minimum. Super-quiet in operation. Sizes from 5 to 100 tons.



Series CF
HORIZONTAL INDUCED DRAFT TOWER

. . . with propeller fan. Neat design, rugged construction, efficient operation. Ideal for small air conditioning and refrigeration installations and for jacket water or compressor cooling. From 2 to 100 tons.



Series K—All Steel
Series S—Steel & Redwood
NATURAL DRAFT TOWERS

. . . available in either all-steel construction which meets municipal fire codes, or the somewhat lower-priced combination steel basins and crowns with redwood posts and louvers. From 3 to 100 tons. Both have Dover bolt-free construction.

read low surface temperatures
in 5 Seconds
Accurately!

On all Jobs...this instrument is invaluable for balancing hot water heating systems, reading floor, wall or ceiling temperatures, checking refrigerated coils, insulation and all other low temperature surfaces.

Quick Accuracy...the 2300 assures the highest standards of speed, accuracy and dependability—you can read most low surface temperatures in 3 to 5 seconds.

Saves Money...the speed and precision eliminate time-wasting rechecking. It is a direct reading unit —no conversion tables, balancing slide wires or batteries are necessary.

Alnor
PRECISION INSTRUMENTS FOR EVERY INDUSTRY

Send Coupon For Full Information

Illinois Testing Laboratories, Inc.
Rm. 513, 420 N. LaSalle St.,
Chicago 10, Illinois

Please send me a copy of Bulletin 2146.

Name..

Company..

Address..

City..........................Zone....State.............

WE HEAR THAT...

▶ The *AIR MOVING AND CONDITIONING ASSOCIATION* was formed in Chicago by 46 manufacturers of air moving and conditioning devices. Association headquarters are located at 2159 Guardian Building, Detroit 26, Mich., under the direction of L. O. Monroe, executive vice president. The original divisions established by the association are as follows: central station air conditioning unit division, centrifugal fan division, industrial axial and propeller fan division, power roof ventilator division, residential fan division, and unit heater division.

▶ The *JAMES F. LINCOLN ARC WELDING FOUNDATION* is offering $20,000 in cash awards for ideas or suggestions that will accelerate progress in arc welding. Prize money will be distributed in 20 awards with a top prize of $5000. Ideas must be submitted by July 30, 1956.

▶ A 17,000 sq ft addition to the Azuza, Calif. plant of *LAU BLOWER CO.* has been completed. The facility is now producing grilles and registers, with production of blowers and blower parts to start soon.

▶ *A. Y. McDONALD MFG. CO.* celebrates its centennial anniversary this year. The company, founded in Dubuque, Iowa in 1856, has grown from a modest machine shop turning out hand pumps to a 310,000 sq ft factory employing 510 persons.

▶ *CLARKE TRYON*, sales manager for *RAMSET FASTENING SYSTEM*, a unit of *OLIN MATHIESON CHEMICAL CORP.*, has predicted that the powder-actuated fastening tools industry would increase its business sevenfold within five years.

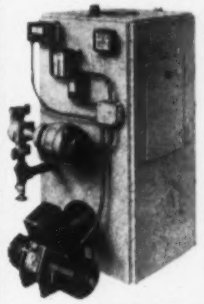
▶ Plans for an expanded line of fans and blowers and increased production volume are underway at *PEERLESS ELECTRIC CO.*, with production started in the firm's new $350,000 fan and blower division plant. The structure, completed December 1, is part of a $500,000 expansion program.

▶ *CHILDS & SMITH*—As part of a "stream-lining" of the organization of this Chicago firm of architects and engineers, in order to handle larger volumes of work, Charles R. Kuglin has been named director of engineering and James H. Stiggleman is now chief mechanical engineer. In the new set-up, one individual will handle all phases of a client's work, so as to coordinate all of Childs & Smith' activities for the individual client.

When I sell a BURNHAM Hot Water Heating System I know I can keep the PROFIT!

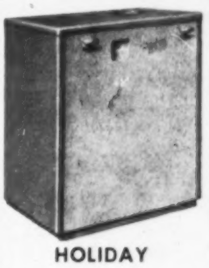
"The high quality of Burnham heating systems makes good profitable sales for me. There are few, if any, call backs and the fine performance of Burnham products makes me a lot of strong friends."

- Wide choice . . . a rugged cast-iron boiler for every fuel and purpose, all giving top performance. That's mighty important! All are designed by an expert engineering staff with over 80 years of experience to draw on. Vertical flue travel over specially designed sections with hundreds of heat-absorbing pins or fins makes them all top fuel savers. All can be equipped for year 'round automatic domestic hot water supply by the addition of Burnham all-copper coils. Get the full story . . . Mail the coupon TODAY.



PACE-PAK*

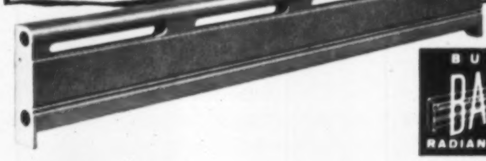
PACEMAKER*



HOLIDAY

Cast-Iron BURNHAM BOILERS for Dependable Performance

"One BASE-RAY Installation sells another"



BURNHAM BASE-RAY RADIANT BASEBOARD

"The minute my customer sees a BASE-RAY® installation, with all its desirable advantages, she's ready to listen. The joy of having no cumbersome radiators or hot-blast registers to interfere with furniture arrangement or decorative effect appeals to her."

But the other features of BASE-RAY appeal as strongly to men: The cleanest, evenest, most draft-free heating known . . . gentle radiant heat that penetrates every nook and corner . . . no cold spots, even near large picture windows . . . no expansion noises. And better still BASE-RAY means true economy . . . it's made of cast iron for long trouble-free life. Yes, customers quickly agree BASE-RAY and Burnham Boilers provide the last word in winter comfort. Particularly when cost is so reasonable . . . only a dollar or two added to carrying charges gives them the finest heating comfort available. And for you — extremely easy installation for new work or modernization. The coupon will bring full details.

*Reg. U. S. Pat. Off.

Burnham Corporation
Irvington, New York
HP-36

Please send me full information on:

BASE-RAY ☐ BURNHAM BOILERS ☐

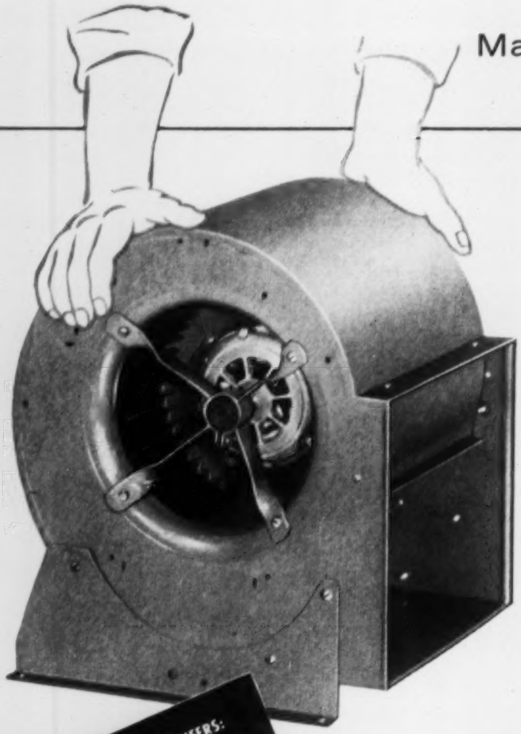
Name...

Address...

City.............................. State..................

Burnham Corporation
IRVINGTON • NEW YORK
FIRST IN THE MANUFACTURE OF BASEBOARD HEATING

Makes modern, compact designs
still more practical



THE NEW *Brundage* POWER-CENTER BLOWER

TEST AND DEVELOPMENT ENGINEERS:
Because of its different performance characteristics, this unit opens new design possibilities. We suggest that you avail yourself of Brundage test data in the early stages of your development program.

The demand for more compact equipment—and ever-higher performance—calls for maximum blower output under increasing static pressures.

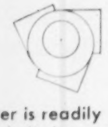
The Brundage Power-Center Blower fits this need to a "T."

Using the new Iron Fireman-developed motor, the Brundage Power-Center Blower eliminates the space—and the cost—required for externally mounted motors, belts, and drives. And test results show that the Power-Center maintains efficiency in the highest static pressure ranges.

Along with these design advantages, the Power-Center affords a new measure of durability. With a rubber cushioned shaft supported on both ends, and sealed ball bearings, it will run quiet and true. It will add to your products' reputation.

Presently available in limited test quantities, the Power-Center will be in full production soon. Now is the time to schedule your test and development program.

MOTOR AND WHEEL are integrally joined, can't work loose. You're assured of full efficiency and quiet operation for customer satisfaction.



UNIVERSAL MOUNTING gives you the greatest design freedom. Each blower is readily installed in any standard discharge position.

TEST BLOWERS are being supplied as motors become available. Brundage engineers will gladly assist you in test and development work.

THE *Brundage* COMPANY
512 North Park Street Kalamazoo, Michigan

Blower Specialists for 35 Years

▶ *EDWARD VALVES, INC.* is doubling the size of its research laboratory at East Chicago, Ind. The addition will include a section devoted to development, assembly and final testing of nuclear power valves.

▶ *A-P CONTROLS CORP.* and *SORENG PRODUCTS CORP.* have merged to form the newly created *CONTROLS CORP. OF AMERICA. LOUIS PUTZE*, president of Soreng, will serve as president of the corporation and *ROY W. JOHNSON*, president of A-P Controls, becomes chairman of the board. Each company forming the corporation will retain its individual identity and will continue to operate as a division under its present name.

▶ *SWARTWOUT CO.* has sold its power plant equipment division to *REPUBLIC FLOW METERS CO.* Republic is establishing a Swartwout Div. to carry on engineering, manufacture, sales and service of Swartwout's line of steam specialties.

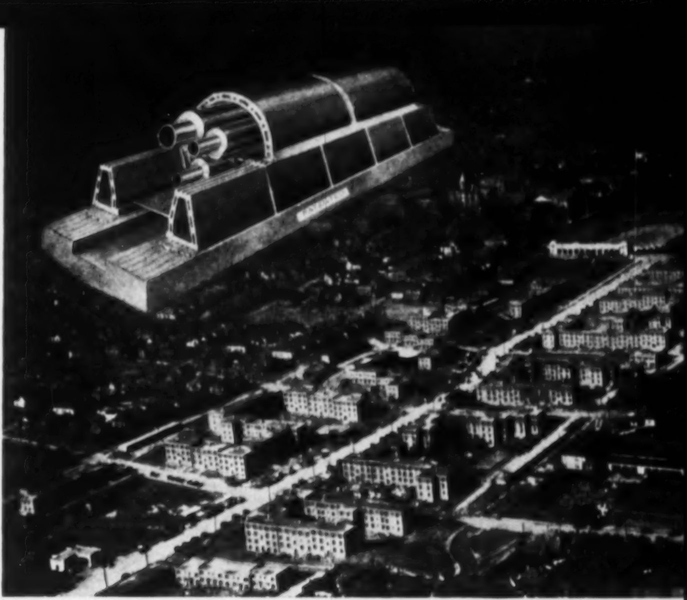
▶ *TRANE CO.* revealed its 1956 operating plans to 64 sales area men representing over 100 offices at a sales meeting held at the company's home office recently. Earlier, the company's six month air conditioning, refrigeration, heating, ventilating and heat transfer sales training program graduated 14 sales engineers.

▶ *COOPER ALLOY CORP.'s* "Quikupl" stainless steel fittings are to be sold and serviced by *VANTON PUMP & EQUIPMENT CORP.* All correspondence and sales will be integrated through the Vanton network of representatives located in major industrial cities.

▶ Officers and employees of *WHITE-RODGERS ELECTRIC CO.* joined in celebrating the completion of the company's 7 millionth hydraulic action control. The "milestone" control was 24 karat gold plated in honor of the occasion.

▶ *WARNER ELECTRIC BRAKE & CLUTCH CO.* will complete a second manufacturing plant costing more than $1 million by mid-1956. The factory will be built on a 64 acre site located in Illinois, 3 miles south of Beloit, Wis. It will occupy 100,000 sq ft initially.

▶ All assets and patent rights of *ROTO-MATION MOTORS, INC.* have been acquired by *PINES ENGI-*



20 YEARS AGO

Therm-O-Tile

REG. U.S. PAT. OFF.

UNDERGROUND STEAM CONDUIT

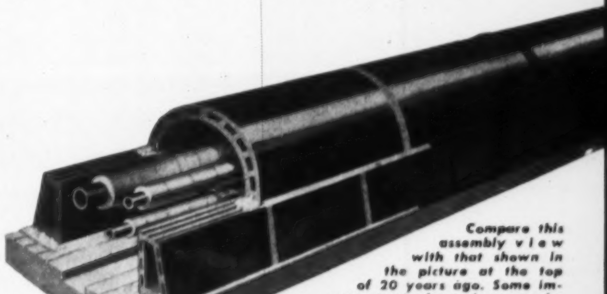
The picture at the top appeared in the June 1936 issue of HEATING, PIPING & AIR CONDITIONING. At that time we were not aware of its importance ourselves for it was the

First Federal Housing Project and Therm-O-Tile Underground Steam Conduit was Specified.

During these twenty years Therm-O-Tile has been specified for many more Federal and other Housing Projects, all over the United States, requiring many miles of Therm-O-Tile. 6,000 feet was used in the FIRST project, at Atlanta, Ga., to supply heat to 700 families.

Ask for Advice. Our engineers, specialists in underground conduit design, will gladly work with you without obligation to develop the best and most economical installation for your purpose.

Bulletin 10154. This bulletin, recently published, gives all of the important data concerning Therm-O-Tile. Ask for a copy.



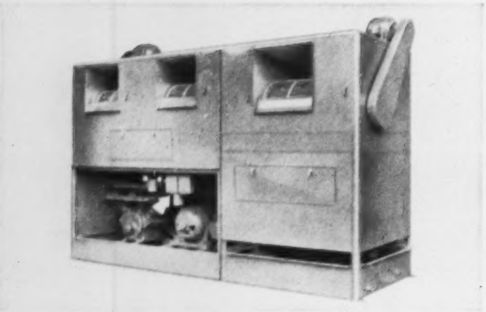
Compare this assembly view with that shown in the picture at the top of 20 years ago. Some improvements have been made. Not many. Therm-O-Tile has ALWAYS been most economical, strong, and durable. Hence its preference by all who choose carefully.

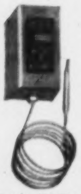
H. W. PORTER & CO., INC.
822-H Frelinghuysen Avenue • Newark 5, N. J.

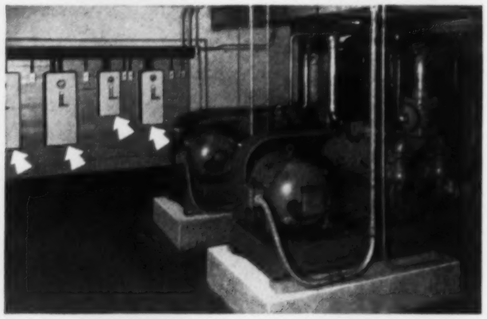
REID HAYDEN, INC.
BALTIMORE, MD. RICHMOND, VA. CHARLOTTE, N. C.

Insulation Engineers & Contractors

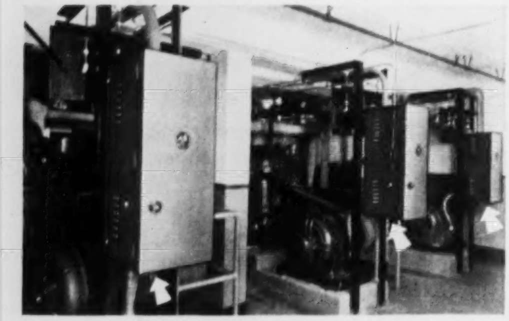
ALLEN-BRADLEY *Motor Controls and Accessories for Refrigeration and Air Conditioning*

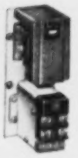

Bulletin 709 Across-the-Line Starters

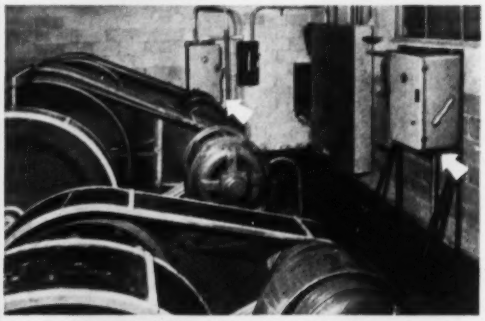

Bulletin 837 temperature control

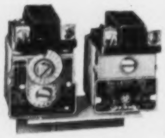

Bulletin 712 Combination Starters

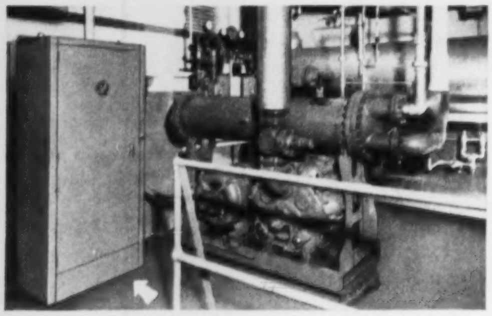
Bulletin 836 pressure switch


Bulletin 640 Manual Resistance Starters

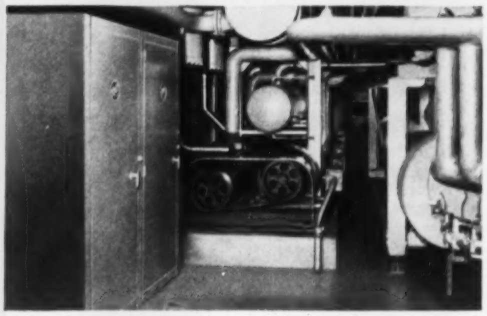

Bulletin 849 pneumatic timer


Bulletin 646 Manual Autotransformer Starters


High and low pressure cutout


Bulletin 740 Automatic Resistance Starter

Bulletin 800 3-way selector switch


Bulletin 746 Automatic Autotransformer Starters

A-B

Quality

The Sign of Quality Motor Control

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

Allen-Bradley motor starters have the simplest contact mechanism yet devised for air-conditioning or refrigeration installations . . . only ONE moving part . . . the solenoid plunger which carries the double break contacts.

There are no trouble-causing pins, bearings, or jumpers. The cadmium silver alloy contacts never need cleaning, dressing, or filing . . . eliminating costly and troublesome maintenance.

Allen-Bradley timers, pressure and temperature switches are reliably accurate . . . precision operation is maintained over long periods of service.

Specify Allen-Bradley—the name that stands for "Quality" motor control. You cannot make a better selection!

Allen-Bradley Co.
1335 S. First St., Milwaukee 4, Wis.
In Canada—
Allen-Bradley Canada Ltd., Galt, Ont.

WE HEAR THAT

Continued

NEERING CO., INC. As a separate subsidiary corporation, *ROTO-MATION, INC.* will continue the manufacture and sale of the former company's oscillating torque motor. Equipment and engineering personnel have been moved to Greenville, Ohio.

▶ The *AIR FILTER INSTITUTE* has elected Sturtevant Division of *WESTINGHOUSE ELECTRIC CORP.* to membership. This brings the institute's total manufacturer-members to 15.

▶ *ALLAN MFG. CO.* has formed an air conditioning division to operate under the name of *ALLAN AIR PRODUCTS CORP.* It will be located in a newly constructed plant at Hicksville, Long Island.

▶ *AMERICAN CRUCIBLE PRODUCTS CO.* is constructing a $100,000 building to house its *KENCO PUMP DIV.* The structure will provide more than 17,000 sq ft of space to be devoted to Kenco facilities, providing space for assembly and storage.

▶ A national sales campaign is being conducted on water heating by gas companies, *AMERICAN GAS ASSN.* announces. Its objective is to upgrade hot water systems in food service establishments and to sell summer water heating to apartments, office buildings, public and private institutions, schools and clubs.

▶ *ALLIS-CHALMERS MFG. CO.* has relocated its Chicago general purpose equipment sales office to 3254 N. Kilbourn Ave. in that city. The 24,000 sq ft building permits consolidation under one roof of warehouse space for distribution and storage space for instrument transformers, v belt equipment, controls, motors and pumps.

▶ Four companies in the industry have been certified as "excellently managed" by the American Institute of Management. These are *CARRIER CORP., COLEMAN CO., PHILCO CORP.* and *RADIO CORP. OF AMERICA.* Carrier, Philco and RCA are receiving the award for the fifth consecutive year. Coleman is recipient for the second time.

▶ A $16 million expansion program for 1956 is underway by *AIR REDUCTION SALES CO.* This expansion plus the new facilities completed since 1951 bring Airco's total investment in the gas producing field over the six year period to about $50 million. New plants are scheduled for completion this year at Chicago and Alton, Ill. and Calvert City, Ky.

Pabst
protects warehouse from condensation with a
MT. HAWLEY
BOILER - BURNER!

With its usual care and thorough planning, Pabst Brewing Company made sure that the Peoria warehouse, where 6,000,000 unfilled beer cans and stacks of cartons are stored, would be free from excess humidity. They took every precaution to make sure that their cans and cartons were protected against moisture penetration.

Safety against moisture was insured by a Mt. Hawley A-300S Boiler Burner (Oil input: 10 gph . . . steam output: 3,000 sq. ft.). Four overhead steam heaters circulated warmed air throughout the 20,000 sq. ft. warehouse.

Mt. Hawley's complete line of compact boiler-burner units cover a range of capacities from 80,000 to 740,000 btu/hr. To defeat a specific problem or to provide efficient, dependable heat for a home or building, Mt. Hawley's the answer.

Write, wire or phone Peoria 2-5448 collect for free literature and prices, at no obligation. Do it today!

MT. HAWLEY FULLY AUTOMATIC OIL BURNERS—A size for any heating need. Efficient . . . long-lived . . . compact . . . silent

MHM MT. HAWLEY MFG. CO.
Dept. H-3 Routes 174 & 88 Peoria, Illinois

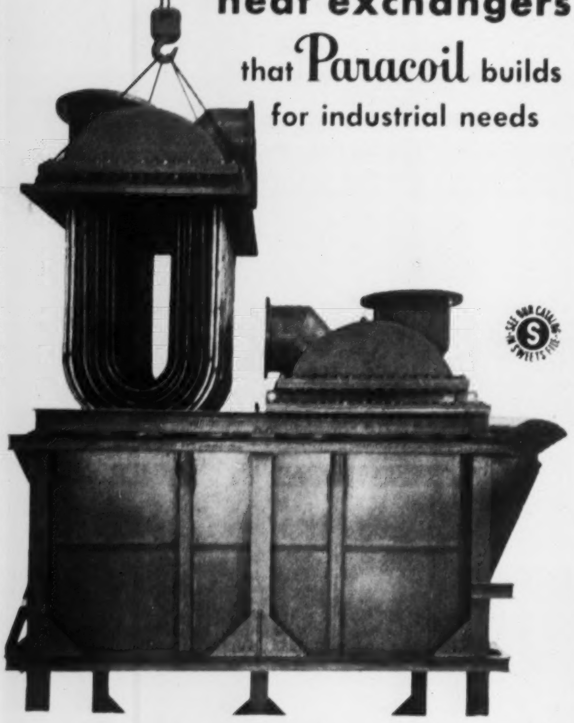
JUST TO SHOW YOU

one of the thousands of custom-made

heat exchangers

that Paracoil builds

for industrial needs



A 13,000 cfm direct-fired air preheater being assembled at our Elizabeth plant. The stainless steel combustion chamber (not shown) sets below the tube banks. Air exit temperature 1000° F.

OUR EXPERIENCED ENGINEERS are available to expedite planning and specification work and to suggest the most suitable and economical exchanger design.

MODERN MANUFACTURING facilities and advanced techniques, skilled and seasoned shop personnel guarantee fabrication to rigid specifications.

FAST DELIVERY is assured by efficient shop work and immediate transportation facilities.

DAVIS ENGINEERING
CORPORATION
30 Rockefeller Plaza, New York 20, N. Y. 1064 E. Grand Street, Elizabeth 4, N. J.

Paracoil's skill to do comes of doing . . . Since 1915

WE HEAR THAT

Continued

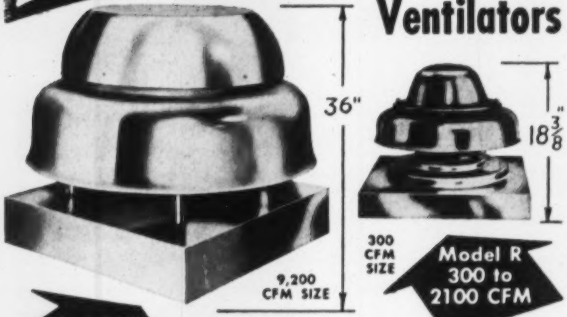
▶ Details of *OLIN MATHIESON CHEMICAL CORP.'s* plans to enter the aluminum industry with an initial investment of $120 million have been announced. The operation is said to be first time in the history of the aluminum industry when coal mined directly on the site is used to provide power requirements for the reduction of alumina to pig aluminum.

▶ *CHICAGO ASSOCIATION OF CONSULTING ENGINEERS*—Charles R. Kuglin, of Childs & Smith, president; E. R. Gritschke, of E. R. Gritschke & Associates, vice-president; and Rudolph Houkal, Perkins & Will, secretary-treasurer. The Chicago association—along with consulting engineer groups in other areas—is studying the advisability of a national association of consulting engineers.

▶ *BORG-WARNER CORP.* has undertaken a "major expansion" in the plastics manufacturing field by appropriating $10 million for the erection of a chemical plant on a recently purchased 322 acre site at Washington, W. Va.

▶ *DR. O. L. BARNEBEY*, president of *BARNEBEY-CHENEY CO.* recently returned from a globe-circling search for new sources of supply for raw materials for activated charcoal.

Low Silhouette COOK Direct Drive Ventilators



Model R 300 to 2100 CFM

Model BV 300 to 9,200 CFM

- Lightweight
- Spun Aluminum
- Rubber Mounting
- Easy Installation
- Non-overloading Blower Wheel (Aluminum)

AVAILABLE IN LOW RPM

Cook direct drive ventilators are now available in speeds as low as 490 rpm. You can install a Cook direct drive unit where normally only belt drives are used. Low tip speeds for quiet operation. Light starting torque with aluminum blower wheel. Only 6" high roof curb required. All aluminum construction saves hundreds of pounds roof load on large models. Also available are wall ventilators, and belt drive centrifugal ventilators. Write for Catalog HP. In Canada write to H. F. Clarke Ltd., 244 W. Broadway, Vancouver, B. C.

COOK VENTILATORS
LOREN COOK COMPANY
Berea, Ohio

These models are shown in the 1956 SWEET'S FILE

You are invited to the

21st NATIONAL Oil Heat and AIR CONDITIONING EXPOSITION

The New, New York City

COLISEUM

JUNE 11-15, 1956

First Oil Heat and Air Conditioning Exposition Held in New York by OHI in 30 Years—First For The Trade in The Coliseum

The Coliseum, a $35 million building, largest of its kind in the world, provides unequaled facilities for your trade show. The entire 3rd floor—70,000 sq. ft. of floor space—all air conditioned—will house hundreds of exhibits. 85% exhibit space already sold. Registration is in a private lobby on the first floor. Special escalators and elevators take you direct to the big show. Food is served in the building. Parking facilities in the basement accommodate 850 cars. No admission charge for members of the industries—your registration badge admits you all days. Hours 1 to 10 P.M. on Monday thru Thursday, 1 to 6 P.M. on Friday.

Spend Your Mornings at Stimulating Business Management Conferences Covering All Phases Of Our Industries.

These conferences—sponsored by the 34th Annual OHI Convention—will be held at the Park Sheraton Hotel within a block of the Coliseum at Columbus Circle opposite the southwest corner of Central Park. The Convention Committee, building the complete program, will feature outstanding, successful operators of oil heating and air conditioning businesses as speakers and conference leaders. Your sessions will jump with inspiring, usable ideas to help you make more money in your business . . . right down to bolts and nuts in practicality. Plan to come! The small fee charged will be far outweighed by any one of dozens of new ideas you'll take home.

MAKE YOUR HOTEL RESERVATIONS NOW

Write to Miss Sylvia Peltonen, Mgr. Housing Bureau, N. Y. Conv. & Visit. Bureau, 90 E. 42 St., New York 17, N. Y. 20 hotels have blocked off 3,000 rooms. Singles $6-19; doubles $8-20; also suites. Tell her you're coming to the Oil Heat Exposition, accommodations desired, your price range, time of arrival and departure. She will have accommodations confirmed by the hotel selected for you. *Write today!*

ENTERTAINMENT

Tickets will be made available for you, *the wife* and family for TV and Radio Shows, theatres, sight-seeing trips, night clubs, etc. to eliminate "scalper" prices. Details on the entertainment plan will soon be published.

Address Space Reservation Inquiries To The Sponsor

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KUNKLE VALVE CO.
115 SO. CLINTON ST.
FORT WAYNE 2, INDIANA

WE HEAR THAT

Continued

▶ *WALTER A. GRANT*, vice president, central engineering staff of *CARRIER CORP.*, has been honored by the *AMERICAN STANDARDS ASSN.* in recognition of his work in the development of American Standards. He represents *THE AIR CONDITIONING AND REFRIGERATION INSTITUTE* on the Standards Council which is responsible for the technical program of ASA.

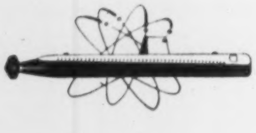
▶ A newly formed corporation, *CLEAVER-BROOKS WESTERN HEMISPHERE, LTD.*, has been established by *CLEAVER-BROOKS CO.* to expedite marketing of the company's products in the western hemisphere. Emphasis will be placed on the Canadian, South American and West Indies markets.

▶ The capital stock of *CHESFLEX CORP.'s* parent company, Chester Packaging Products Corp. is being acquired by the St. Regis Paper Co. through an exchange of stock.

▶ Ground has been broken for a $400,000 warehouse and office building at Los Angeles for *COLEMAN CO.*,

MECHANICAL ENGINEERS

What Should an ME Know About Atomics?



Quite a bit these days, with so many companies getting into the field. While many new firms are now starting to explore the field, Electric Boat Division of General Dynamics Corporation led the way with the building of the first nuclear powered submarines, Nautilus and Sea Wolf.

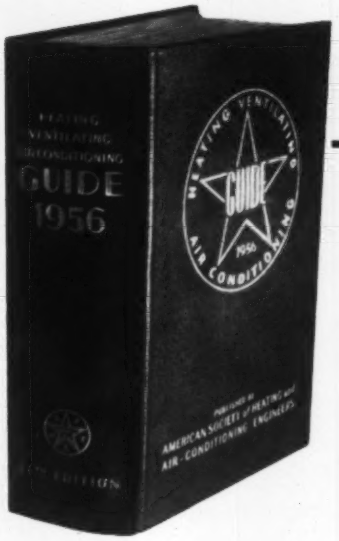
In addition to increasing its engineering force for work on new and greatly advanced nuclear submarines, Electric Boat is expanding Research and Development operations to include the development of additional practical uses for nuclear energy.

Right now Electric Boat has interesting positions for Mechanical Engineers with experience in vibration and shock, machine design, stress analysis, hydraulics, rotating machinery, power plants or air-conditioning and piping.

Study for bachelor's or advanced degrees is encouraged at Electric Boat, with courses in mathematics, naval architecture, nuclear engineering and nuclear submarine systems offered within the plant, and tuition paid by the company for study in these or other fields at leading colleges and universities.

Men interested in these openings should write complete details of background and experience including initial salary requirements. Interviews will be arranged promptly for qualified applicants. Address Mr. Peter Carpenter.

Electric Boat Division
GENERAL DYNAMICS CORPORATION
GROTON CONNECTICUT
near New London on the Connecticut shore



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Section V, Systems and Equipment, for example includes 26 chapters on as many subjects. Gravity warm air, forced warm air, steam, and hot water heating systems are discussed in the first 4 chapters. Radiators and convectors, panel heating, unit air conditioners, central systems for air conditioning are among the many subjects in this section.

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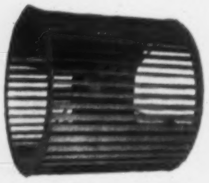
Double Inlet Forwardly Curved Wheel

● Built to YOUR OWN Specifications!

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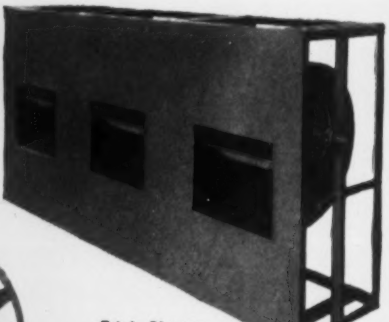
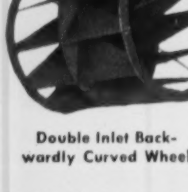

Triple Blower Assembly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INVESTIGATE for your own requirements. Send us your specifications for prompt, no-obligation quotation.

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WE HEAR THAT

Continued

INC. The new building will have 34,500 sq ft of floor space, including 3500 sq ft of air conditioned office space.

▶ *FULLER CO.* has acquired all of the outstanding stock of *SUTORBILT CORP.*, manufacturer of positive pressure blowers, pneumatic conveyors, fans, material feeders and related products. Sutorbilt will continue to operate as a separate company.

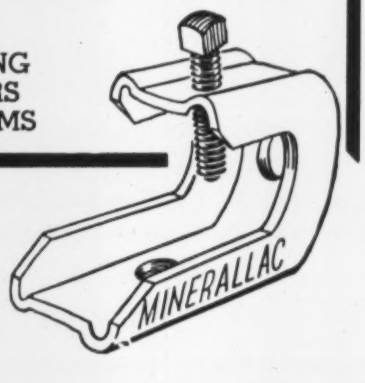
▶ A $5 million building program was announced recently which will give *ARMOUR RESEARCH FOUNDATION* of *ILLINOIS INSTITUTE OF TECHNOLOGY* "one of the most complete industrial research centers in the world." The program calls for the construction of three buildings and substantial additions to two others over the next 10 years.

▶ *JOY MFG. CO.* has launched a new facility at Buffalo which is to be known as its *TURBO-DYNAMICS DIV.* Company officials state that its objective is the establishment of a major new division producing advanced compressors, turbines and other air and gas handling devices.

MINERALLAC

BEAM CLAMPS

FOR MOUNTING HANGERS ON I-BEAMS



Mounts Minerallac hangers No. 0 to No. 6 on I-Beams safely without necessity of drilling holes. Made of heavy gauge zinc plated steel with deep drawn ribs to give needed strength, these durable, light weight beam clamps have 1/4-20 tapped holes—will fit beam flanges up to 1/2 inch thick. Furnished with case-hardened set screw. Low cost.

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MINERALLAC

COSTS MORE and WORTH IT!

Grant Wilson

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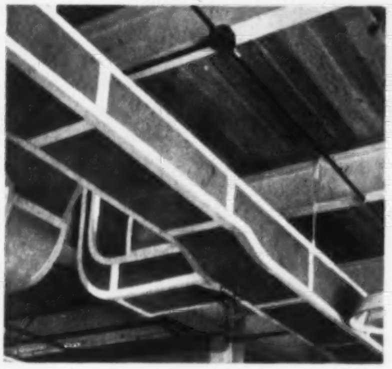
ASBESTOS PROTECTED



Despite the advent of many lower priced insulations, many of the nation's leading architects and engineers continue to specify Grant Wilson Dux-Sulation. One reason is that Dux-Sulation is just about indestructible — can't possibly be crushed or cracked. Its insulation and sound absorption efficiency, high to start with, *cannot* be impaired during installation.

Dux-Sulation can't powder, shift or sift. There are no "thin" spots, even at corners. There is no deterioration of any kind, no change of any kind. Insulating values are constant, indefinitely!

Special adhesive and tape (supplied) obviate the need for any additional "fasteners". If desired, Dux-Sulation can be applied in the shop and still withstand all necessary handling. On all counts, especially on projects where nothing less than the best is acceptable, Dux-Sulation is still your logical choice — the insulation you can specify with *absolute confidence* . . . no ifs, ands or buts!

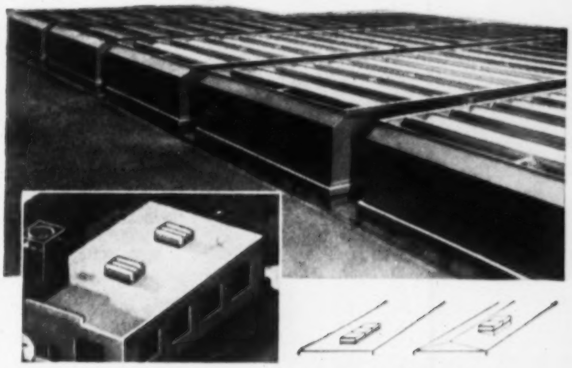
write for Bulletin 567H-3

Grant Wilson inc.

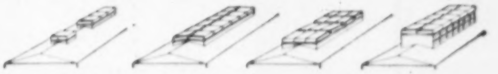
ASBESTOS and INSULATING MATERIALS

141 WEST JACKSON BLVD • CHICAGO 4, ILLINOIS

Swartwout Airmover® gives you *flexibility of application*



An economical and broadly adaptable roof ventilation method



Airmover can be applied to any type of roof, in any quantity. Use it in single units — as in the smaller illustration — or in whole "batteries" that practically cover the roof. Its unusual flexibility is as valuable as its low, spreading contour that eases roof load when large scale installations are needed.

Only 32" high, Airmover's multiple heat valve design offers least possible air travel friction to contaminated air. It does not mar the building's appearance; avoids stays and guy-wires. Provides lowest cost ventilation per square foot of roof opening. Airmover is completely weatherproof. Its adjustable dampers provide variable opening. A valuable safety facility that can be added is a fusible link arrangement to open dampers automatically in case of fire. Write for Bulletin AM-F.

18511 Euclid Avenue, Cleveland 12, Ohio

The Swartwout Co.

Roof Ventilators and Ventilating Louvers

POWER PLANT EQUIPMENT • PROCESS INDUSTRY CONTROLS

HOW TO PROTECT
Pipe, Pipe Joints, Couplings and Tanks
AGAINST CORROSION

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. . . the Coal Tar Coating in Handy Tape Form

Since 1941, TAPECOAT has proved its ability to keep vulnerable steel surfaces "like new" year after year. TAPECOAT is a quality coal tar coating in tape form equivalent to a hot-applied coal tar pipe line coating. It resists moisture, acids, alkalis, soil stress, electrolysis, chemical fumes, fly ash, salt water, salt-laden air, barnacles, and other severe corrosive and abrasive conditions—above and below ground. Self-bonding, it requires no foreign adhesives. Cuts maintenance and replacement costs. Comes in rolls of 2", 3", 4", 6", 18" and 24" widths. Asphalt TAPECOAT in handy tape form is also available. Write for details and prices.

The TAPECOAT Company
Originators of Coal Tar Tape Protection
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MEETINGS & CONVENTIONS

MARCH 18-21—*American Society of Mechanical Engineers*, Spring meeting. Multnomah Hotel, Portland, Ore. ASME headquarters: 29 W. 39th St., New York.

MARCH 21-23—*18th Annual American Power Conference*. Hotel Sherman, Chicago. Sponsored by Illinois Institute of Technology, 35 W. 33rd St., Chicago.

MARCH 22-23—*Third Annual Air Conditioning Conference*. University of Missouri. Information: Prof. M. M. Bolstad, mechanical engineering department, University of Missouri, Columbia.

MARCH 28-30—*Warm Air Heating Short Course*. Pennsylvania State University, University Park, Pa. Succeeding short courses are scheduled: April 2-5, Michigan State University, East Lansing; April 4-6, Syracuse University; April 9-12, North Dakota State College, Fargo; April 16-19, Iowa State College, Ames; April 23-26, Long Island T & A Institute, Farmington, L.I., N.Y. Sponsored by National Warm Air Heating and Air Conditioning Association, 640 Engineers Bldg., Cleveland 14.

GET NON-CLOG PUMP PERFORMANCE
at "ordinary" pump prices—with the
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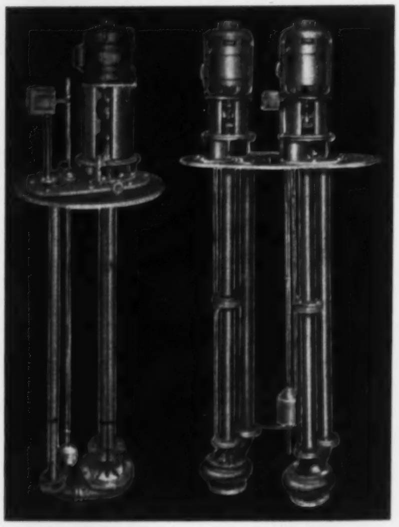
Now — at no more than the cost of ordinary pumps — you can get full *non-clog* performance with the American-Marsh NKS! On vertical wet pit applications, the NKS delivers remarkably high efficiency, handling clear liquids or liquids with solids up to three inches in diameter.

You'll also find it extremely versatile in application. You can get both single and duplex models with wetted parts furnished in standard iron, bronze or special alloys. Numerous items of optional equipment further increase adaptability to special requirements.

The NKS Pump is moderately priced . . . and like *every* American-Marsh Pump, receives a complete operating test before shipment. So when you specify sewage and sump pumps, be sure you get the *extra performance* American-Marsh Pumps deliver . . . *at no extra cost!*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Models from 25 to 800 GPM at heads from 10 to 60 feet.

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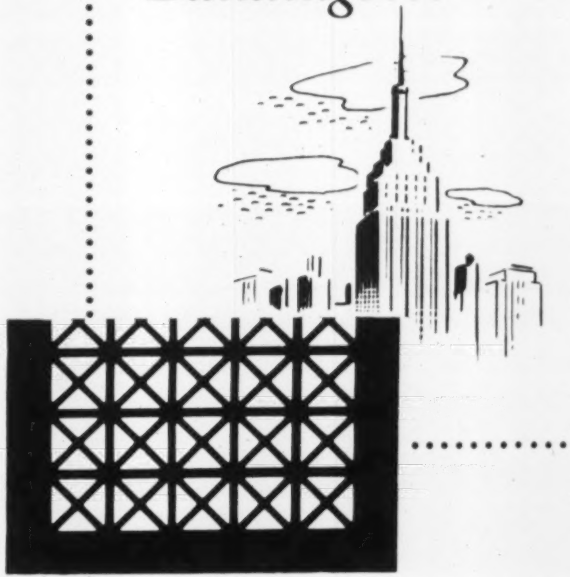
For Beauty In Buildings . . .



What makes one building interior stand out over others? In many cases it's that extra touch of splendor given by Hendrick Grilles. There are over one hundred different Hendrick Grilles available to harmonize with the most modern designs for residential, business or public buildings . . . many are exclusive Hendrick designs. Each design can be furnished in a wide range of overall dimensions, bar sizes and number of perforations. And they're easy to install because they always lay flat . . . don't bend or warp. Write for complete details.

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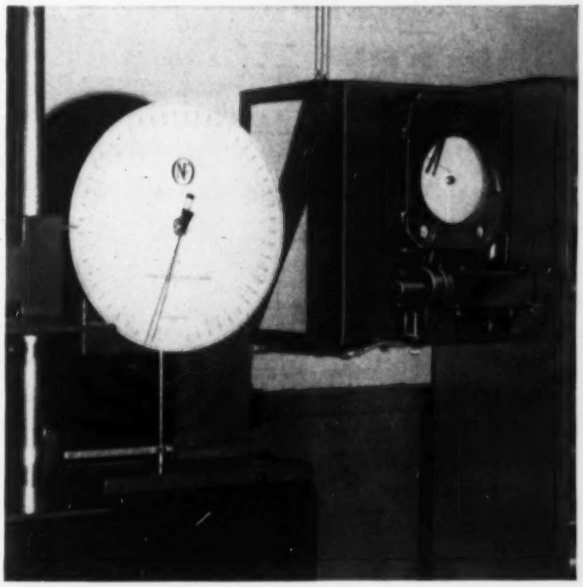
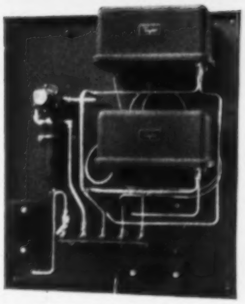
±1% HUMIDITY CONTROL

For Heating, Piping and Air Conditioning





Now your laboratory or test room can have humidity control on the basis of *percentage of relative humidity*—instead of on the individual performance of wet and dry bulbs. Taylor's Wet-and-Dry Bulb Temperature Controller (above) can maintain ±1% relative humidity. That means you have standard conditions for physical testing of products. This amazingly close humidity control is achieved by the Taylor FULSCOPE* Recording Wet-and-Dry Bulb Controller using as measuring systems two Taylor TRANSAIRE* Temperature Transmitters with SPEED-ACT* compensation for lags in heat transfer (see picture at left).

If your production requires close humidity control, it will pay you to look into Taylor Automatic Control with TRANSAIRE Transmitters. Ask your Taylor Field Engineer or write for **Bulletin 98140.** Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

*Trade Mark

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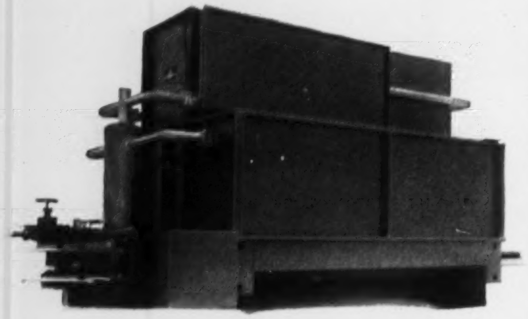

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*gives you lower cost refrigeration, saves you **LABOR**, Power, Water*

- **Because Niagara "Duopass" pre-cooling removes super-heat and gas condenses at lower temperature.**
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- **Because you save 95% of cooling water cost.**

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First cost is low; freight is low because of the lowest space/weight ratio; you save much labor in erection. Capacity range is 90 to 240 tons. No other condensing method gives you so much saving in money and trouble.

Write for Niagara Bulletin 131.

NIAGARA BLOWER COMPANY

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District Engineers in Principal Cities

NIAGARA Aeropass
SECTIONAL CONDENSER

NIAGARA *Over 40 Years' Service in Industrial Air Engineering*

MEETINGS & CONVENTIONS

Continued

APRIL 18-19—*National Industrial Research Conference.* Sherman Hotel, Chicago. Sponsored by Armour Research Foundation of Illinois Institute of Technology. Conference secretary: Joseph J. Kowal, Armour Research Foundation, 10 W. 35th St., Chicago 16.

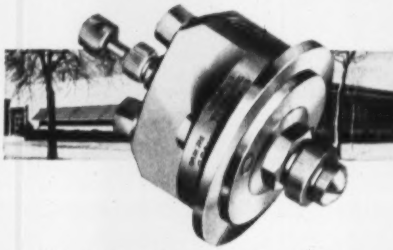
APRIL 18-20—*Conference on Marine Corrosion and Fouling Problems.* La Jolla campus, University of California. Registration and information: University of California Engineering Extension, Los Angeles 24.

APRIL 19-20—*Science Section of the Environmental Equipment Institute,* second annual meeting. Sheraton Hotel, Chicago. Information: H. F. Sander, meeting chairman, care of Vapor Heating Corp., 6420 W. Howard St., Chicago.

APRIL 19-21—*Gas Appliance Manufacturers Association,* annual meeting. The Greenbrier, White Sulphur Springs, W. Va. Association headquarters: 60 E. 42nd St., New York 17.

MAY 4—*Annual Conference for Engineers.* Ohio State University, Columbus. Information and reserva-

to the 99 plants in 100 *who use* SPRAY NOZZLES



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In the search for doing things better and faster, have you overlooked the importance of spray nozzles? Your application may be commonplace or complex... but whatever it is, properly engineered spray nozzles can make a vast difference. Let Spraying Systems Co., America's foremost authority on industrial spray nozzles show you why and how. As a first step, write for catalog.

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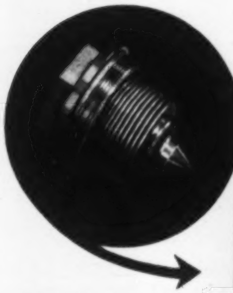
FLOAT and THERMOSTATIC

TRAPS

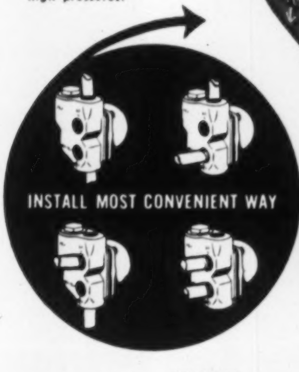
they perform **BETTER** *because there's a* **BIG DIFFERENCE!**

For example, look at the bellows . . . it is precision formed under pressures many times higher than ever encountered in service; it adjusts *itself* instantly to varying pressures or temperatures . . . always conserves steam. If bellows is damaged, spring action closes valve; equipment becomes cold and easy to locate.



TOP
IN
BOTTOM
OUT

This is the popular ¾" 69B, only one in the complete line of Sterlco Float and Thermostatic Traps. Other models range from 1" to 2" for low pressures, and from ¾" to 1¼" for high pressures.



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Only 4 screws to remove to inspect any Sterlco trap . . . complete inspection WITHOUT disturbing pipe connections. Larger models have clean out plugs. Replacement parts require no shimming or adjustment.

Ideal for **UNIT** *heaters*

Sterlco Float and Thermostatic Traps are ideally suited for original installation or modernization of existing unit heaters. Their dependability, compactness, large capacity, easy serviceability, and rugged construction make Sterlco traps the outstanding performers on all steam heating equipment.

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EFFICIENT, and DEPENDABLE
Sterlco Products Distributed through
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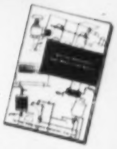

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CAPITOL RECORDS

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Factory Rep: Air Conditioning Supply Co.
A. C. Contractor: Western Air and Refrigeration, Inc

d-h SINCE 1910

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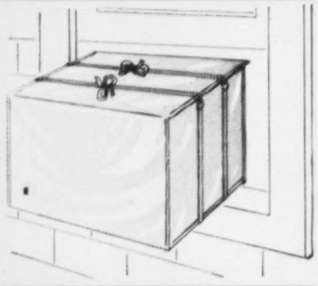
ROOM AIR CONDITIONER
Sell a BUDLEW Cover
for
EXTRA
$$$
PROFIT!



EVERYONE who buys a window unit will need a cover to keep out rain, snow and dirt this coming winter. Cash in on extra profits by selling a BUDLEW Cover *with each unit* — or use as a power-packed premium to speed sales! Unique bellows design and double tie cord assure snug fit. In sizes for all popular makes . . . assorted colors.

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Sturdy Plastic-Coated Fabric $3.95 Retail Price
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MEETINGS & CONVENTIONS *Continued*

tions: Harold A. Bolz, College of Engineering, Ohio State University, Columbus 10.

MAY 7-9—*Air Conditioning and Refrigeration Institute*, annual meeting. The Homestead, Hot Springs, Va. George S. Jones, managing director, 1346 Connecticut Ave., N.W., Washington 6, D.C.

MAY 7-11—*American Welding Society*, national Spring meeting. Buffalo. AWS headquarters: 33 W. 39th St., New York 18.

MAY 9-11—*Fourth Welding Show*. Memorial Auditorium, Buffalo. Sponsored by American Welding Society, 33 W. 39th St., New York 18.

MAY 9-12—*Sheet Metal Contractors' National Association, Inc.*, annual convention. Shoreham Hotel, Washington, D.C. J. D. Wilder, executive secretary, 170 Division St., Elgin, Ill.

MAY 11-12—*Michigan Engineering Society*, 76th annual convention. Pantlind Hotel, Grand Rapids. Information: D. B. Apted, 945 San Lucia Dr., Grand Rapids, Mich.

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HIGHWAY
HOTEL

travelers who stop here . . . enjoy

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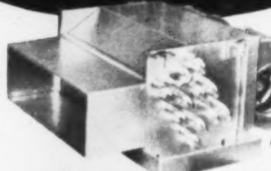
Air Conditioning



C. H. W. 90
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"Goodwill" has wisely been defined as the disposition of a person to return to the place where he has been well treated.

And a point that is *always* important for true guest satisfaction is proper heating and air conditioning comfort.

That's why so many hotels and motels . . . large and small . . . feature International Air Conditioning. Its efficiency, dependability and whisper-quiet operation reflect the kind of goodwill that brings guests back again . . . and again. Write for details.

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AURORA *Always* PUMPS

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AIR CONDITIONING UNITS
•
also for
GENERAL SERVICE

These are outstanding pumps, high in favor with air conditioning contractors and manufacturers of air conditioning equipment. Mechanical seal requires no packing or maintenance. Disassembly without disturbing pipe connections or hold down bolts.

- LOW COST
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- MECHANICAL SEAL
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CASINGS
Vertically split. Casing wearing ring standard.

MECHANICAL SEAL
Standard, located in packing cover.

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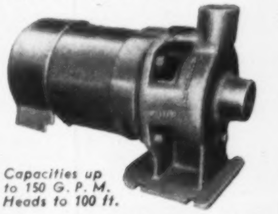
Balanced, enclosed type, high grade bronze.



Capacities up to 150 G. P. M. Heads to 100 ft.

AURORA TYPE JMC Close-Coupled Pump

Capacities up to 85 G. P. M., Heads to 40 ft.

AURORA TYPE SAC Close-Coupled Pump

MOTOR
NEMA specs., stainless steel shaft on JMC and SAC — for all circuits and various enclosures.

BALL BEARINGS
Built into motor on JMC and SAC

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ALSO—AURORA SPLIT CASE CENTRIFUGAL PUMPS
— single and two stage for water supply, handling condenser circulating water, brine circulation, booster service and many other duties.

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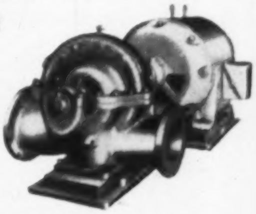

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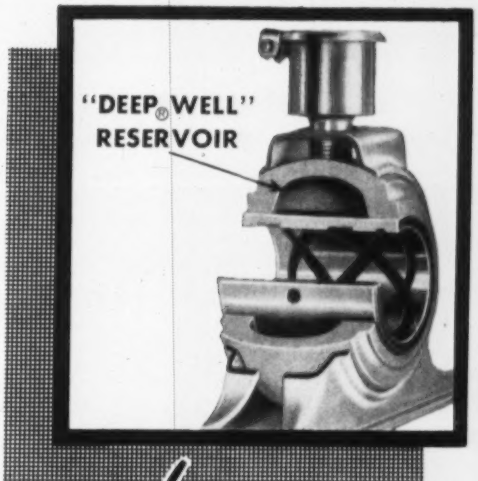
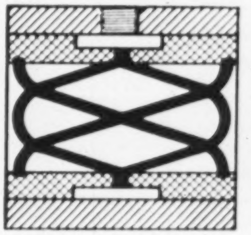
THE NEW YORK AIR BRAKE COMPANY
80 LOUCKS STREET • AURORA • ILLINOIS

Randall PILLOW BLOCKS



CONTROL LUBRICATION



Randall's exclusive "controlled lubrication" feature assures adequate lubrication to all parts of the bearing surface as it is needed. Illustrated is the undercut, graphited bearing showing the feed plugs and net work of grooves that distribute the oil from the large "Deep® Well" reservoir. Heat increases the capillary action of the graphite thus increasing the flow of oil and assuring adequate lubrication at elevated temperatures. When heat subsides, flow of oil is automatically reduced. Randall pillow blocks are completely self-aligning, quiet in operation, and give long trouble-free service. They are available in many different styles for light, normal or heavy duty on shafts from $\frac{1}{2}$" to $3\frac{15}{16}$" inclusive.

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PILLOW BLOCKS
SHEET LUBRICATOR

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THRUST WASHERS
SAFETY COLLARS
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"engineer-approved"

ELGEN All-Tite VANE RUNNERS NOW IN COILS!
Save Time and Money... with ELGEN All-Tite VANE RUNNERS
THE EASIEST AND QUICKEST WAY EVER DEVISED
for installing single or double blade turning vanes in square elbows. No special tools required.

New production machinery of our own exclusive design, now enables us to produce button type Elgen All-Tite vane runners in continuous coils, effecting a savings in *your cost per job.*

COILED ELGEN ALL-TITE VANE RUNNERS MEANS . . .

- *Less Waste!* Waste pieces due to short ends are a thing of the past. Vane runner metal is coiled in 100 foot lengths, you just pull out the exact footage needed.
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- *Unrolls absolutely flat!* Vane runner metal emerges from the box at bench height . . . absolutely flat . . . ready for use.

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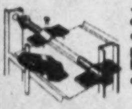

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MEETINGS & CONVENTIONS

Continued

MAY 14-15—*Steel Boiler Institute*, annual meeting. Brown Hotel, Louisville. SBI headquarters: 1308 Land Title Bldg., Philadelphia 10.

MAY 14-17—*American Society of Mechanical Engineers*, conference to coincide with First Design Engineering Show, Convention Hall, Philadelphia. Show sponsored by Clapp & Poliak, Inc., 341 Madison Ave., New York 17. ASME headquarters: 29 W. 39th St., New York.

MAY 15-18—*Heating, Piping and Air Conditioning Contractors National Association*, annual meeting. Kentucky Hotel, Louisville. HPACCNA headquarters: 30 Rockefeller Plaza, New York 20.

MAY 22-25—*National Warm Air Heating and Air Conditioning Association*, board of trustees and committee meetings and technical conference. Edgewater Beach Hotel, Chicago. The Association is at 640 Engineers Bldg., Cleveland 14.

JUNE 3-6—*American Society of Refrigerating Engineers*, Summer annual meeting. Cincinnati. ASRE headquarters: 234 Fifth Ave., New York 1.

Where sustained capacity counts

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BLACKMER rotary pumps

- Self-adjusting for wear vane construction
- Capacity — 5 to 1500 gallons per minute
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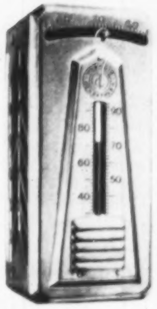

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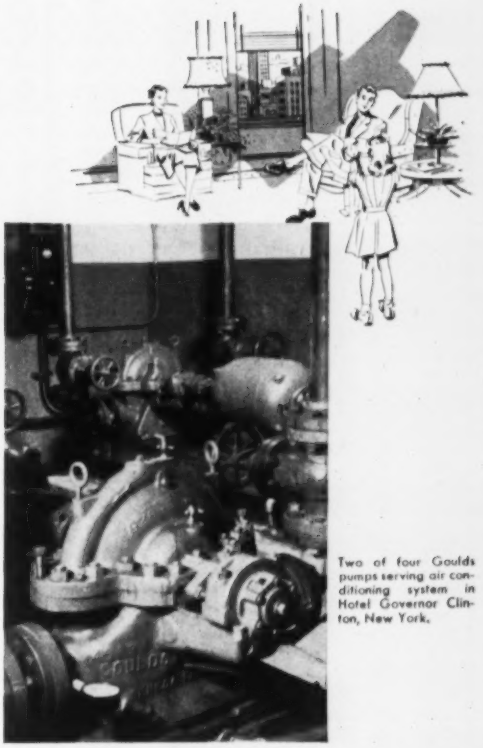

Two of four Goulds pumps serving air conditioning system in Hotel Governor Clinton, New York.

These pumps insure cool comfort for *Governor Clinton's guests*

With 1,200 rooms to air condition, New York's Hotel Governor Clinton needs pumps it can depend on.

That's why the hotel's management selected Goulds pumps for their new air conditioning system. They knew the Goulds reputation for efficient operation and long, trouble-free service.

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Your Goulds representative will welcome an opportunity to help you select the right pumps to suit your needs. Or write directly to our home office in Seneca Falls. Your inquiry will receive prompt attention.

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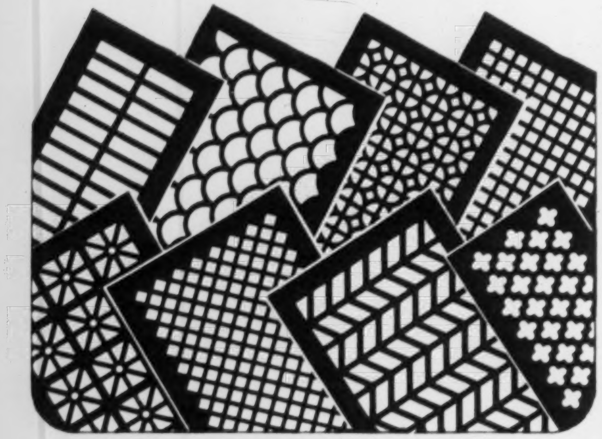

MEETINGS & CONVENTIONS

Continued

JUNE 4-7—*National District Heating Association*, 47th annual meeting. Inn and Lodge, Williamsburg, Va. John F. Collins, Jr., secretary-treasurer, NDHA, 827 N. Euclid Ave., Pittsburgh.

JUNE 4-8—*National Fire Protection Association*, annual meeting. Hotel Statler, Boston. The association is at 60 Batterymarch St., Boston.

JUNE 11-15—*Electrostatic Precipitation Seminar*. Pennsylvania State University. Chairman: R. E. Armington, assistant professor of electrical engineering, Pennsylvania State University, University Park, Pa.

JUNE 11-15—*21st National Oil-Heat Show*. Coliseum, New York. Managing director: R. H. L. Becker, Oil-Heat Institute of America, Inc., 500 Fifth Ave., New York 36.

JUNE 11-15—*Seventh National Plastics Exposition*. Coliseum, New York. Society of the Plastics Industry, Inc., 67 W. 44th St., New York 36.

JUNE 17-21—*American Society of Mechanical Engineers*, semi-annual meeting. Statler Hotel, Cleveland.

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HIGH FIRING RATES at HIGH EFFICIENCY

MULTURI (MULTIPLE VENTURI) BURNERS

- Formed steel mixers, finished for corrosion resistance, offer minimum resistance to mixture flow, result in uniform high capacity.
- High temperature resisting stainless steel flame retainers insure flame stability over a wide capacity range.
- Mixer design produces a hot clear flame, results in high combustion efficiency with minimum excess air.

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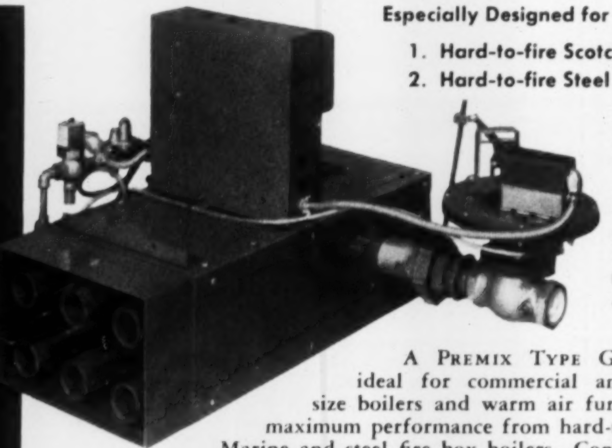
1. **Hard-to-fire Scotch Marine Boilers**
2. **Hard-to-fire Steel Fire Box Boilers**



Multuri Burners available in standard units, 4 to 54 mixers. Capacities 700,000 to 10,800,000 BTU/hr. Higher capacities can be furnished.

A PREMIX TYPE GAS BURNER, ideal for commercial and industrial size boilers and warm air furnaces. Gives maximum performance from hard-to-fire Scotch Marine and steel fire box boilers. Controlled flame characteristics make the burner a natural for units with extensive refractory surface. Suitable for any gas at 4" gas pressure or more. Permits high firing rates at high efficiency. Simple to install, adjust, and operate. Completely Factory Wired and Assembled — Ready for Immediate Installation !

Write for detailed information—or for a questionaire listing all the data necessary for correct specifications and efficient installation.

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Design and Development Engineer experienced in dust handling systems, design of industrial dust and fume control and collecting equipment. Position requires initiative, technical ability and experience to develop, design and test practical, marketable equipment; from his ideas and those of others. Must have successful record designing industrial equipment.

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To survey and study industrial plant conditions, prepare recommendations for dust and fume control including system design, layout and calculation, equipment selection, cost estimates. To establish application engineering practices on control systems and equipment. Investigate new application fields. Duties involve some field work.

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Replies confidential. State education, experience, age, expected starting salary.

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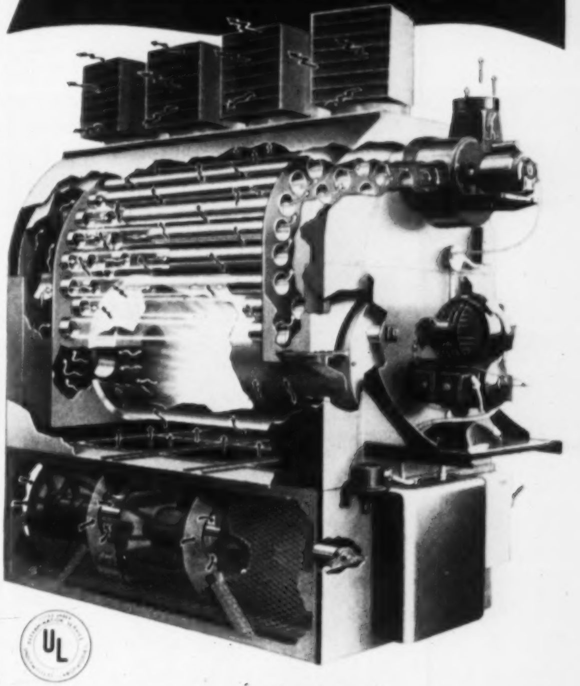

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300,000 BTU's TO 2,000,000 BTU's

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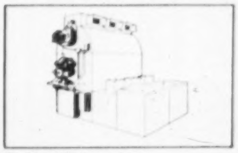
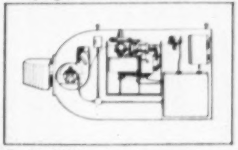
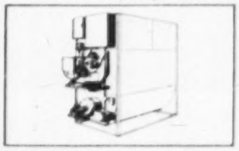


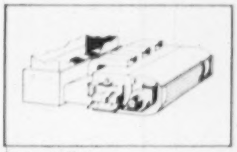
Series "FD"
Upright for duct distribution.



Series "H"
Horizontally suspended.



Series "U"
Inverted suspended.



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Horizontally for duct distribution.

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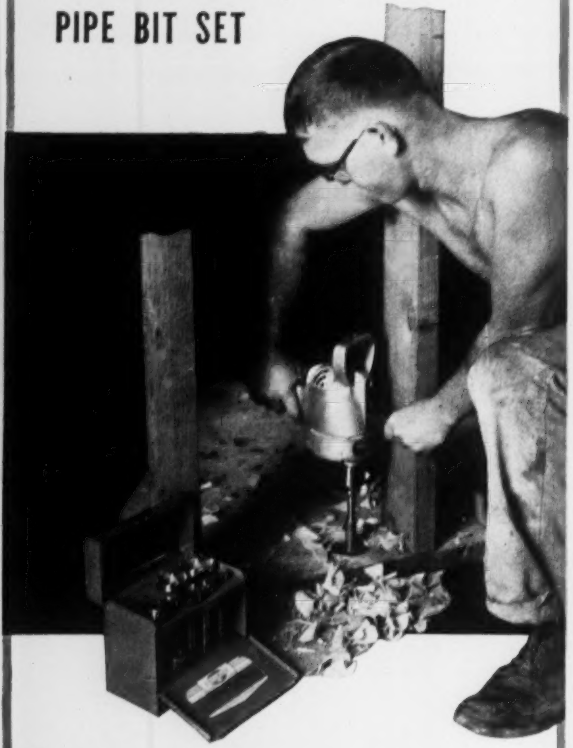

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MEETINGS & CONVENTIONS

Continued

Headquarters: 29 W. 39th St., New York 18.

JUNE 17-22—*American Society for Testing Materials.* Chalfonte-Haddon Hall, Atlantic City. ASTM headquarters: 1916 Race St., Philadelphia 3.

JUNE 18-20—*American Society of Heating and Air-Conditioning Engineers, Inc.*, semi-annual meeting. Shoreham Hotel, Washington, D.C. ASHAE headquarters: 62 Worth St., New York 13.

JUNE 21-23—1956 *Heat Transfer and Fluid Mechanics Institute.* Stanford University. General chairman: S. J. Kline, Mechanical Engineering Department, Stanford University, Stanford, Calif.

JUNE 25-29—*American Society for Engineering Education*, annual meeting. Iowa State College, Ames. Secretary: W. Leighton Collins, University of Illinois, Urbana.

SEPT. 17-21—11*th Annual Instrument-Automation Conference and Exhibit.* Coliseum, New York. Sponsored by Instrument Society of America. Exhibit office: 250 W. 57th St., New York.

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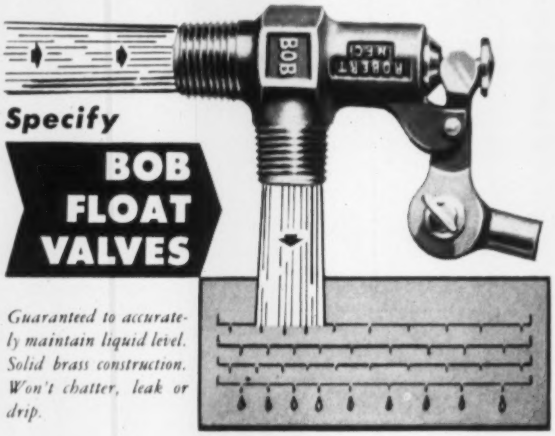
For COOLING TOWER applications . . .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Power burner design assures perfect combustion, regardless of natural draft conditions—*saves an average of 10% in fuel*—ideal for down-draft heating plants. The Economite burns so smoothly you can't tell when it's running.

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Lo-BLAST Power Gas Burners are available in capacities from 70,000 to 20,000,000 BTU input. Write for literature.

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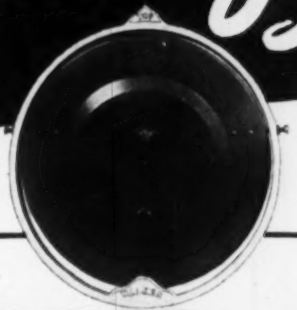

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MEETINGS & CONVENTIONS

Continued

Week of OCT. 15—*American Gas Association*, annual convention. Atlantic City. AGA headquarters: 420 Lexington Ave., New York 17.

OCT. 22-26—*44th National Safety Congress & Exposition*. Chicago. National Safety Council, 425 N. Michigan Ave., Chicago 11.

OCT. 24-27—*Air-Conditioning and Refrigeration Wholesalers*, annual meeting. Jung Hotel, New Orleans. Headquarters: 2607 N. High St., Columbus, Ohio.

NOV. 25-28—*American Society of Refrigerating Engineers*, semi-annual meeting. Boston. Information: ASRE, 234 Fifth Ave., New York 1.

NOV. 25-30—*American Society of Mechanical Engineers*, annual meeting, Statler Hotel, New York. ASME headquarters: 29 W. 39th St., New York 18.

NOV. 26-30—*22nd National Exposition of Power and Mechanical Engineering*. Coliseum, New York. Under auspices of American Society of Mechanical Engineers. Manager: E. K. Stevens, care of the Exposition, 480 Lexington Ave., New York 17.

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All of the outstanding qualities that have made MARVEL SYNCLINAL FILTERS the overwhelming choice in the filtration of hydraulic oils and other oil base liquids have been adapted to provide the same efficiency in the filtration of water.

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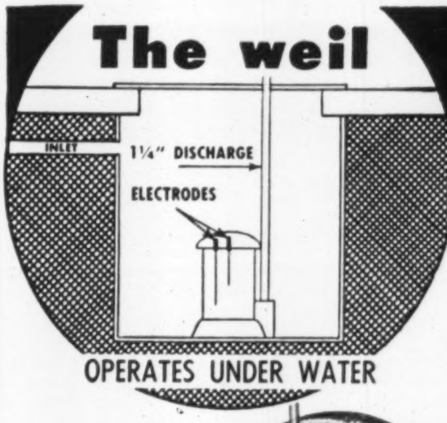

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- **1/3 H.P. Capacitor Motor**
  Hermetically sealed. Cannot be damaged by power failure.
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  No moving parts.
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  Can be installed in a 15" opening with less than 2 ft. headroom clearance above-pump.
- **Easy to Install**
  Only one piping connection.
- **Economical Installation**
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- **Stocked by Your Jobber**

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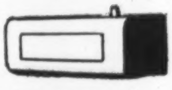

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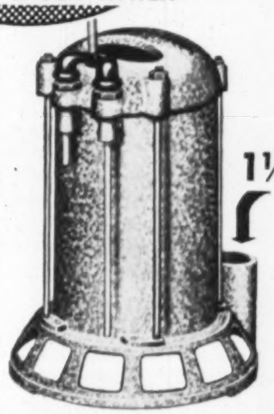

Same pump used in sumps 2 to 12 feet deep.

Fig. SS800

Recommended minimum sump I.D.: 18". Height of pump: 12¾".

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Disch. (ft.)	5	10	15	20
Cap. GPH	3600	3350	2400	1830

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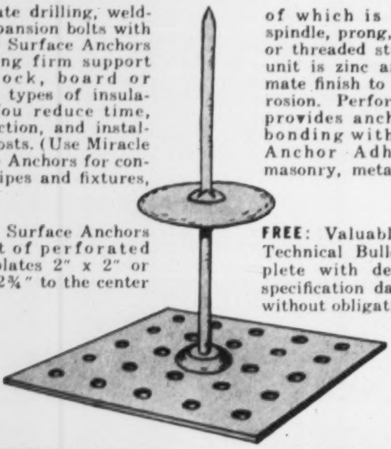

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MEETINGS & CONVENTIONS

Continued

NOV. 26-30.—*Third International Automation Exposition.* Trade Show Bldg., New York. Management: Richard Rimbach Assoc., Inc., 845 Ridge Ave., Pittsburgh 12.

NOV. 27-30—*National Warm Air Heating and Air Conditioning Association*, committee meetings and annual convention. Conrad Hilton Hotel, Chicago. NWAHACA headquarters, 640 Engineers Bldg., Cleveland 14.

NOV. 27-30—*Ninth National Chemical Exposition.* Public Auditorium, Cleveland. Chicago Section of the American Chemical Society, 86 E. Randolph St., Chicago 1.

FEB. 25-*MAR.* 1, 1957—*International Heating & Air-Conditioning Exposition.* International Amphitheater, Chicago. Under auspices of American Society of Heating and Air-Conditioning Engineers, in conjunction with its 63rd annual meeting, also at Chicago. Exposition management: International Exposition Co., 480 Lexington Ave., New York 17. ASHAE headquarters: 62 Worth St., New York 13. ⌗

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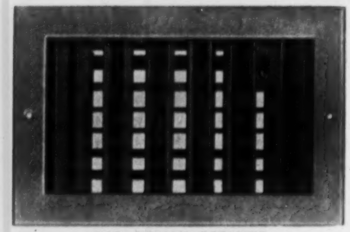

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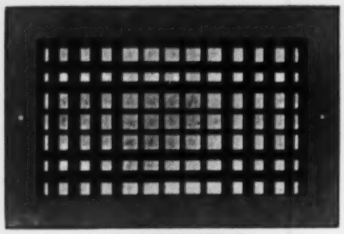

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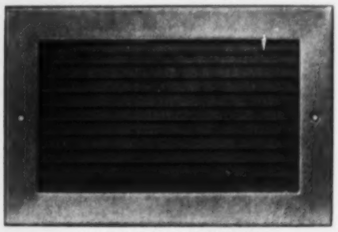

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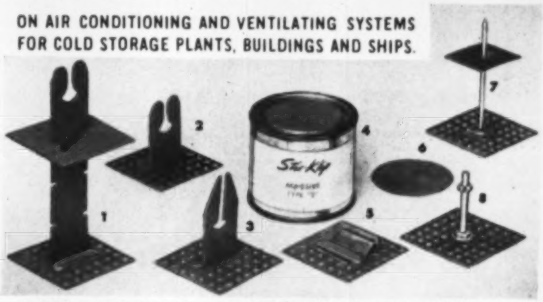

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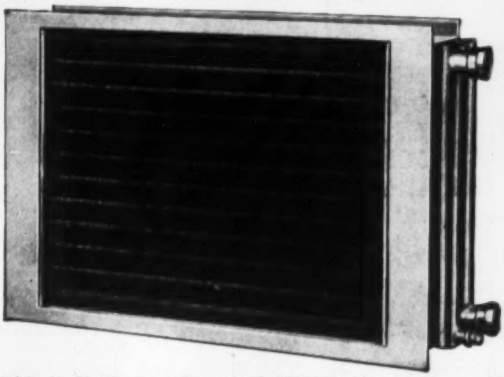

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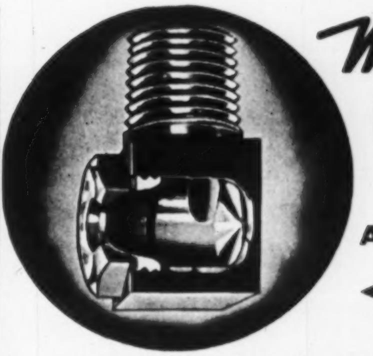

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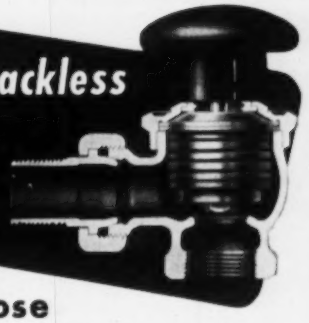

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ACCIDENT PREVENTION MANUAL FOR INDUSTRIAL OPERATIONS—Third Ed. 1341 pp. National Safety Council, 425 N. Michigan Ave., Chicago 11. $13.50.

TABLES OF THERMAL PROPERTIES OF GASES—By Joseph Hilsenrath, C. W. Beckett, W. S. Benedict, Lila Fano, H. J. Hoge, J. F. Masi, R. L. Nuttall, Y. S. Touloukian and H. W. Woolley. National Bureau of Standards circular 564. 478 pp. U.S. Government Printing Office, Washington 25, D.C. $3.75.

DESIGN AND INSTALLATION OF WARM AIR WINTER AIR CONDITIONING SYSTEMS AND YEAR 'ROUND AIR CONDITIONING SYSTEMS—Fifth Ed. National Warm Air Heating and Air Conditioning Assn., 640 Engineers Bldg., Cleveland 14. $1.00.

STANDARDS OF THE HYDRAULIC INSTITUTE—10th Ed. 234 pp. Hydraulic Institute, 122 E. 42nd St., New York 17. $4.75.

METHODS OF RATING AND TESTING AIR CONDITIONERS—ASRE standard 16-56. American Society of Re-

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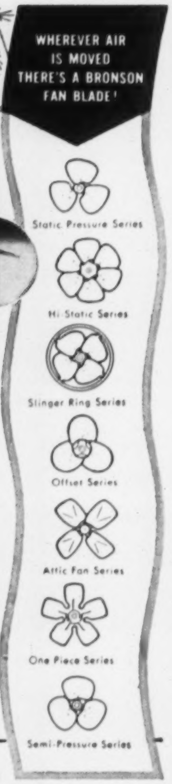

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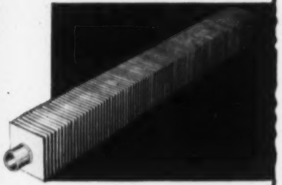
frigerating Engineers, 234 Fifth Ave., New York 1. $1.00.

The Investigation of Atmospheric Pollution—Report on observations in the 10 years ended March 1954. Fuel Research Station, Department of Scientific and Industrial Research, Blackwell Ln., Greenwich, London, England. $1.35.

Studies of Thermal Conductivity of Liquids, Parts I and II—By Byron C. Sakiadis and Jesse Coates. Reprint series No. 25 from Engineering Experiment Station, Louisiana State University, Baton Rouge. 25c (no stamps).

Standard Methods of Testing and Rating Forced-Circulating Air-Cooling and Air-Heating Coils—Bulletin No. 202. 20 pp. Heating and Cooling Coil Manufacturers' Association, 2159 Guardian Bldg., Detroit 26.

Report of the Fortieth National Conference on Weights and Measures, 1955—National Bureau of Standards Miscellaneous Publication 216. 143 pp.



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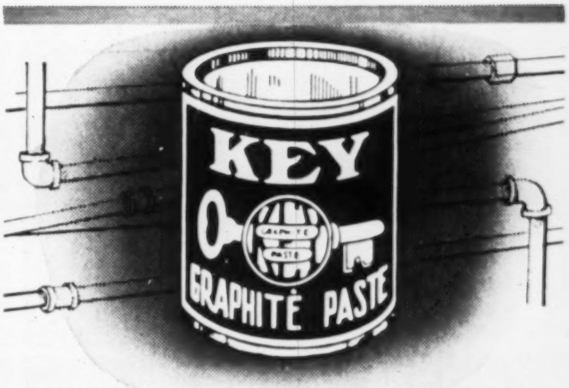

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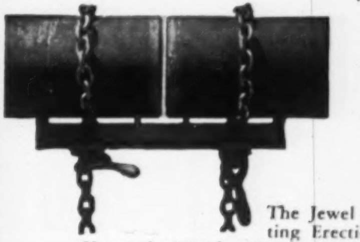

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U. S. Government Printing Office, Washington 25, D.C. 70c.

The Welding of Austenitic Chromium-Nickel Steel Piping and Tubing—27 pp. American Welding Society, 33 W. 39th St., New York 18. $1.00.

Hydraulic Operation and Control of Machines—By Ian McNeil. The Roland Press Co., 15 E. 26th St., New York 10.

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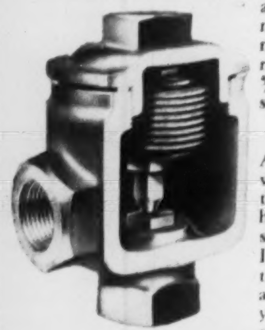

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REGIONAL ENGINEER — A large well-known manufacturer of heating and cooling equipment has an opening for a regional engineer. Interested applicants must have good knowledge of the application, installation and servicing of heating and cooling equipment for both the residential and commercial fields. Must be willing to travel. Area to be covered consists of the middle Atlantic states and New England. Successful applicant will be expected to locate centrally in this area. Our organization knows of this advertisement and your responses will be held in strictest confidence. In replying, please include a resume of your background, experience and salary requirements. Address Key 1222A, Heating, Piping & Air Conditioning, 6 North Michigan Ave., Chicago 2, Ill.

WANTED — ENGINEER

INDUSTRIAL AIR CONDITIONING

Established Southern Textile Equipment Concern has challenging opportunity for graduate engineer between thirty and forty with drive, ambition, and integrity. This man would be concerned with all phases of design, engineering and sale of textile mill air conditioning. All replies held in strictest confidence.

Address Key 1225A
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Chicago 2, Illinois

patents . . .

INVENTION RECORD and Patent Information Booklet free on request. Franklin W. Durgin, Registered Patent Agent, c/o Evergreen Farm, 12500 Meadowood Drive, Silver Spring, Maryland.

Classified Advertising

Rates of classified advertising are 15 cents for each word, including heading and address. One inch $7.00. Count nine words for keyed address. Minimum $2.50. Closing date 10th of the month preceding publication.

situations open . . .

WANTED TWO DISTRICT MANAGERS One to be located in Metropolitan New York area and one in San Francisco. To supervise Sales Offices of prominent manufacturer of Heating, Cooling and Air Conditioning equipment on East and West Coast areas. Send complete resume of education, experience, and salary requirements to Key 1213A, Heating, Piping & Air Conditioning, 6 North Michigan Ave., Chicago 2, Ill.

3 — JUNIOR SALES ENGINEERS OR SALES TRAINEES — By a New Jersey Electric Utility — For Commercial Air Conditioning and Refrigeration, Power Sales and Heat Pump Sales Contact Work. Age 25-35. Technical education or equivalent. Some experience desirable. Reply stating age, education, experience, personal particulars and minimum salary expected; also, enclose recent photograph. Address Key 1220A, Heating, Piping & Air Conditioning, 6 North Michigan Ave., Chicago 2, Ill.

PIPING DESIGN & LAYOUT ENGINEER
HEATING & VENTILATING ENGINEER
Due to our expansion program, the abovementioned permanent positions are available in a large pulp and paper manufacturing plant in the Upper Midwest. The individuals desired should be graduate engineers with a minimum of five to ten years experience who are well versed in their respective fields. Our employees know of these openings. Your confidential reply should include personal, educational and work history together with salary thinking. Write Key 1218A, Heating, Piping & Air Conditioning, 6 North Michigan Ave., Chicago 2, Ill.

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For permanent position in established consulting engineer-architect office. Heating, ventilating, and piping design experience related to industrial and commercial buildings. Send complete resume of experience to

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EXECUTIVE — SALES AND ENGINEERING — with 36 years experience in charge of entire East for well known manufacturer of Fans & Blowers desires good connection. Confidential. Write Key 1231A, Heating, Piping & Air Conditioning, 6 North Michigan Ave., Chicago 2, Ill.

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REPRESENTATIVES needed in many midwestern, southern and western states by national manufacturer of a complete line of oil and gas fired heating equipment. Interested in representatives serving wholesalers and/or dealers. Send complete information. Address Key 1221A, Heating, Piping & Air Conditioning, 6 North Michigan Ave., Chicago 2, Ill.

lines wanted . . .

A new sales organization now being formed by two men with national sales and engineering experience in heating, ventilating and air conditioning. Large dealer following. Looking for manufacturers to represent in the Philadelphia market. Address all replies to Key 1226A, Heating, Piping & Air Conditioning, 6 North Michigan Ave., Chicago 2, Ill.

for sale . . .

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AIR CONDITIONING SALES ENGINEER

OPPORTUNITY for Sales Engineer TO PLAN, DEVELOP, and ADMINISTER RESIDENTIAL AIR CONDITIONING SALES PROGRAM for a leading heating manufacturer in SOUTHERN CALIFORNIA. Ability to conduct and evaluate field studies, market research and application surveys essential. Address Key 1228A, Heating, Piping & Air Conditioning, 6 North Michigan Ave., Chicago 2, Ill.

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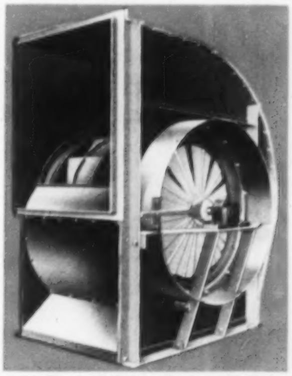

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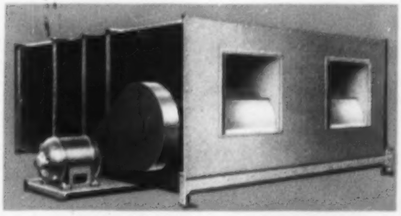

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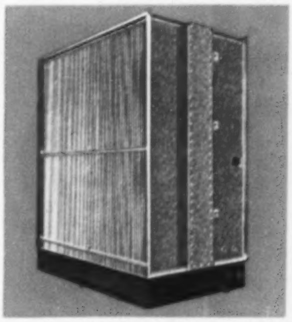

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